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PSYCHE.

ON COLEOPTERA FOUND WITH ANTS. FIFTH PAPER.

BY HENRY FREDERICK WICKHAM, IOWA CITY, IOWA.

From time to time it has been possible to add a few records to those which I have published in the earlier papers of this series, but it has not been practicable to make a systematic effort to work out the myrmecophilous fauna in the neighborhood of my own home. The fragmentary nature of the observations is well realized — but even fragments may be of use to a future monographer.

I. *Formica exsectoides* Forel (name from Rev. P. Jerome Schmitt). A large colony of these ants has constructed a good-sized hillock of cinders by the side of one of the railroad tracks. An examination of this nest, on the second of May, 1896, revealed many specimens of *Hetaerius brunnipennis*, *Batrisus fossicauda*, *Anthicus melancholicus* and one *Monotoma fulvipes*. On April 24, 1898, I examined another hillock (in this case made of earth, with a thin covering of cinders) belonging to the same species. By scraping away the earth to a depth of three or four inches, I got six *Batrisus fossicauda*, which seemed to be in galleries close to the surface of the mound, especially around the edges. Three *Megastilicus formicarius* were also secured in this hill, besides quite a lot of *Anthicus melancholicus*. The Megastilicus is an active insect and loses no time in burying itself when uncovered by the investigator. It most likely belongs to the group of predatory myrmecophiles.

II. *Formica fusca* var. *subsericea* Say. This ant is much affected by Coleopterous insects, as will be seen by reference to earlier papers. A very large nest was examined in March and found to contain quite a number of *Hetaerius brunnipennis*. On the seventeenth of April I looked again and found more of these beetles as well as a lot of *Ptomaphagus parasitus*, part of which were under a log which lay across the top of the mound while others were obtained deep down in the galleries. One *Megastilicus formicarius* was captured near the surface of the hillock, and as I had never before seen this beetle alive I searched carefully for others but without success. Besides these, and some unidentified Staphylinidae, I found an example of *Thiasophila americana* Fauvel MS. Later visits showed that the Hetaerius could be found as late as the middle of May, and at this time I got *Batrisus fossicauda* (chiefly near edges of the nest) and a few *Anthicus melancholicus*.

III. *Formica nitidiventris* Em. I cannot find that any beetles are recorded from the nest of this ant, and my own observations had, until recently, been without positive result. On the fourth of last May, however, I found *Cremastochilus harrisii*, in the midst of a strong colony, under a piece of board, on grassy land. Records of the hosts of Cremastochilus are much to be desired, so few having been published, in spite of the undoubted status of these beetles as true guests.

IV. *Lasius americanus* Em. This ant frequently makes its home under leaves in the woods, or under loose bark of fallen trees, or of stumps. Since such situations are also favorite haunts of many Scydmaenidae, Pselaphidae, and Staphylinidae, it is often difficult to conjecture the true relationships of the ants to the accompanying beetles. It may not be out of place, however, to record the following captures of Coleoptera with these ants: *Pycnophus rasus*, *Connophron pallidum*, *C. capillosulum* without record of date; *Batrisus frontalis* in nest under bark, April 28, both this and *B. globosus* in the same situation a month later; *Tmesiphorus costalis*, *Batrisus frontalis*, *Rybaxis conjuncta* var. *truncaticornis* from leaves covering a nest, May 29. *Eurypronota discreta* occurred on one occasion only. *Myrmobiota crassicornis* is often rather abundant in subcortical nests, and is, undoubtedly, a true guest, as it seems not to be met with elsewhere.

V. *Lasius aphidicola* Walsh. Often lives in immense colonies, under large stones, on wooded hillsides, and quite frequently inhabits rotten logs, in moist forest lands, these logs being perforated in all directions by galleries. A small nest, investigated on May 31, yielded *Connophron pallidum*. A much larger one, beneath a flat stone, was infested by *Ceophyllus monilis*, of which I took seven specimens. These beetles walked about, carrying themselves high with a "tiptoeing" motion, among the immense swarm of ants, apparently without suffering molestation nor receiving aid from their hosts. On May 8 I had examined a large colony occupying a rotting stump, and took from the galleries three specimens each of *Adranes lecontei*, *Ceophyllus monilis* and *Batrisus globosus*, one *Homoeusa expansa* and sixteen *Tachys ferrugineus*. This Tachys often, if not always, occurs with ants. Mr. Hayward has found it with them, Mr. G. Beyer once sent me several, mounted with Lasius, from New Jersey; and personally I cannot recollect having met with it except in the above mentioned nest. A colony of what I took to be *Lasius aphidicola*, but which Dr. Wasmann identifies as *L. interjectionis* Mayr, at home in an old stump, was sifted over on May 29, and from it I obtained *Adranes lecontei*, *Ceophyllus monilis* and *Limulodes paradoxus*.

VI. *Tapinoma sessile* Say. This species is very common near Iowa City, but seems but very little favored by guests. I have a record of *Connophron longipenne* taken with it, April 17, but the occurrence is probably accidental.

VII. *Ponera pennsylvanica* Buck. Frequently met with, but I have only a single record, *Connophron clavicorne*, found with this ant, April 17.

VIII. *Aphaenogaster aquia* Buck. Nests in the ground, the galleries opening in the protection of a stone or piece of wood, the latter often much pierced by the tunnels. During April and May, *Limulodes paradoxus* occurs abundantly with this species, and the little beetles may be seen running around among their hosts without any molestation whatever.

IX. *Pogonomyrmex opaciceps* Mayr. Specimens of this ant were sent me from the neighborhood of Denver, Colorado, by Mr. Ernest J. Oslar, who writes that it is the host of *Cremastochilus saucius* and *C. knochii*, specimens of which I have also received from him. He finds the beetles with their hosts at various times, my examples of *saucius* being dated E. Denver, April 10, Berkeley, June 3, and Salida, July 11. The *knochii* are marked Berkeley, April 8, and Chimney Gulch, June 18. He says of *saucius*: "I generally find it in ant hills but never more than one in each, at all times of the year. Last winter, just before Christmas, a friend and myself drove to a place called Parkers, twenty-five miles south of Denver, on a three days' jack rabbit hunt, while a foot of snow lay on the ground. I kicked up four *saucius* from the ant hills during the three days of our hunting. Of course they were dormant, and I carried them in an empty cartridge shell. By the time I got back to Denver they were all lively from the warmth of my pocket." I notice that it is difficult to get perfect specimens of this beetle, the legs often being much mutilated, supposedly by the ants which are large and fierce creatures.

X. *Pheidole vinlandica* Forel, (name from Rev. P. Jerome Schmitt). From a nest of this species I got a single specimen of *Atinus monilicornis*. The colony was housed under a large stone, by the roadside, in the vicinity of Nashville, Tennessee. The date was about the middle of August.

XI. *Cremastogaster olinelata* Say. Although this is one of our commonest Iowa ants and occurs in great colonies, I seldom find any beetles with it except such as are clearly casual companions. I have, however, a record of *Pycnophus rasus* which may be worth saving.

All of the foregoing notes are to be considered as referring to observations made near Iowa city, unless otherwise stated. I wish to express my thanks to Mr. Theo. Pergande and to Rev. P. Jerome Schmitt for kind aid rendered in the way of identifications.

SYNOPSIS OF SUBFAMILIES AND GENERA OF NORTH AMERICAN TETTIGIDAE.

(Based upon the synoptical table of Prof. Bolivar.)

BY J. L. HANCOCK, CHICAGO, ILL.

1 (2) Antennae filiform, rarely the last two articles before the extremity very little compressed.

2 (1) Face more or less oblique or perpendicular; median ocellus situated in front of the eyes.

3 (16) Anterior femora more or less compressed, carinate above.

4 (5) Frontal costa furculate between the eyes, the branches strongly diverging, forming a frontal scutellum. Subfamily CLADONOTINAE Bol.

5 (4) Pronotum largely compressed, above completely foliaceous, rounded-angulate, posteriorly truncate. Gen. *Chorophyllum* Serv.

6 (8) Antennae with twelve to fourteen articles; pronotum anteriorly truncate, or angulate, or rarely angulate produced, posterior angles of the lateral lobes turned downwards, more or less rounded, not obliquely truncate. Subfamily TETTIGINAE Bol.

7 (13) Vertex advanced in front of the eyes, wider than one of them, in profile united with the frontal costa, generally angulate anteriorly.

8 (6) Antennae with twelve, rarely thirteen articles; pronotum with the dorsal front margin angulate produced, median carina cristiform, more or less arched longitudinally, median lobule of the posterior margin of lateral lobe feebly developed, sub-humeral sinus for the reception of elytra shallow. Gen. *Nomotettix* Morse.

9 (10) Antennae with fourteen or often thirteen articles; pronotum generally not advanced upon the head to the eyes, median lobule of posterior margin of the lateral lobe well developed, the sub-humeral sinus quite deep. Gen. *Tettix* Charp.

10 (9) Vertex a little advanced in front of eyes, equal to, or considerably wider than one of them, in profile united with the frontal costa rounded, or depresso-rounded.

11 (12) Vertex considerably wider than one of the eyes, branches of the frontal costa more or less strongly divergent, antennae consisting of twelve to thirteen articles. Gen. *Neotettix* Hanc.

12 (11) Vertex equal to one of the eyes, branches of frontal costa narrowly forked, straight and evenly divergent. Gen. *Merotettix* Morse.*

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*Given on the authority of Prof. A. P. Morse; a recently described genus in Journ. N. Y. Ent. Soc. vol. vii, p. 199, 1899.

13 (7) Vertex not advanced in front of the eyes; median carina of pronotum scarcely elevated.

14 (15) Body usually broad between the shoulders; vertex narrower or equally wide with one of the eyes; second femoral carinae more or less flexuous, or undulate, or lobate, or clypeate, very rarely straight. Gen. *Paratettix* Bol.

15 (14) Vertex strongly narrowed in front, the front border nearly one-half the breadth of an eye, or less; body usually prolongate; branches of frontal costa sub-parallel, closely approximate. Gen. *Telmatettix* gen. n.

16 (3) Anterior femora above distinctly and broadly sulcate; pronotum in front produced more or less above the head, very frequently hooked, accuminate, or, to a certain extent, obtusely rounded angulate; antennae sixteen to twenty-two articles. Subfamily Batrachidinae Bol.

17 (18) Body strongly tumid; dorsum of the pronotum convex, lightly punctate, lateral carinae in front of the shoulders wanting. Gen. *Paxilla* Bol.

18 (17) Body narrower; dorsum of the pronotum, between the carina rather concave, conspersed with more or less longitudinal wrinkles, lateral carinae in front of the shoulders present. Gen. *Tettigidea* Scudd.

THE "COCOONS" OR "CASES" OF SOME BURROWING CATERPILLARS.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

From much watching of pupating caterpillars, especially of such sphingids and ceratocampids as go into the ground to pupate, I gradually came to doubt the exactness of the statements, made in many books, that such caterpillars spin "cases" or "cocoons" in the earth inside of which they transform.

Last summer I had a good supply of *Protoparce celeus* and *carolina*, *Philampelus pandorus* and *achemon*, *Ceratomia amyntor*, and *Paonias excoecatus*, with which I experimented.

Into tin boxes I put sifted earth deep enough to give ample room for cases. Into each box I put a larva ready to pupate, and wandering in search of a suitable place. All burrowed very soon, and I left the boxes undisturbed for a few days, that no unusual condition should affect the larvae.

On examining the boxes, which was very carefully done, I found, in every case, no sign of silk, and no "case" which held together at all. I found an oval cavity, smooth, and large enough to hold the pupa easily, allowing free motion of the abdominal segments and even space to turn over completely. The walls of the cavity seemed pressed by the turning of the caterpillar and moistened by the sticky fluid which exudes from such larvae in the early stages of pupation. This combined fluid and pressure served to keep the earth from falling upon the caterpillar under ordinary circumstances, but a very slight touch with pencil, fingers, or stem sent the upper walls down as dirt, not as fragments of a case or of a wall.

I then put less earth in a tin and put on it a caterpillar which was ready to burrow, and watched it.

Butting its head against the earth it made a small hole, then worked the hole larger until it would admit the entire body, which the earth was not deep enough to cover.

The caterpillar then moved about in this hole, butting the sides with its head until there was room to spare, and the walls were packed by the pressure. Exudation had begun and the fluid was forced against the walls by the crawling and butting of the caterpillar, so that all was absorbed by the earth.

There was no spinning whatever, nor any of the weaving motion of the head made by the caterpillar when spinning. At first the caterpillar lay on its venter, shortened and moist. After a day or two it turned upon one side, curled slightly in a curve. Next it turned on the other side, then on its back, still slightly curled. Then the ends of the skin began to look empty, and the caterpillar slowly rolled over upon the venter, and soon cast the larva skin. I repeated this experiment several times, and with different species, and always with the same result.

Dryocampa rubicunda gave the same results also, though much less fluid exudes from these.

I satisfied myself that with these species the cell formed for pupation could not be called either a case or a cocoon, since it could not be taken up as a whole without taking up enough of the surrounding earth to keep from it all pressure and jar, as these destroy it at once.

I tried the same plan with *Deilephila lineata*, which in my former experiences has always spun a slight cocoon, like a fish-net, between leaves.

The four specimens I put into the four tins with earth, shaped cells for themselves, and did not spin at all. They did not burrow as deep as the other larvae however.

The boxes were kept tightly covered except when I was watching the caterpillars, so that the earth was not dried too much.

The pupae were all perfect, but no better, except those of the *Protoparce* and *C. amyntor*, than those made by the other larvae pupating in tins without earth.

In making their cells the caterpillars did not bring earth to the surface, but merely pushed it back on all sides, so that in the tins with deeper earth there was no trace of any burrow or caterpillar.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—VIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Calocampe undulata Linn. The larva that bears this name in Europe is well known, having been frequently described and figured. (See Hofmann, Raup. Gross-Schmett. Eur., p. 230). The American larva has been described only by Fitch. Our larva differs decidedly in habit, coloration and food plant from the European one, so that it hardly seems as if they could be the same species. Newman says the European moth lays the eggs singly, or at least never adjoining each other, and the larvae are not decidedly gregarious and Hofmann does not contradict this. The European larva has a brown head and is gray below, brown above, faintly lined with black, the dorsal line finely edged with whitish and with a whitish stigmatal line. The food plant is willow. The following description will show how our larva differs:—

Eggs. Laid in a pile, nine square and four layers deep, the upper layers composed of less eggs than the lower and consequently smaller, but on one side all the layers are equal. Elliptical, strongly flattened above and below and a little so on the sides by mutual pressure, the ends rounded, the one toward the tapering side of the pile a little depressed, none truncate; reticulations flattened, not raised, the egg indistinctly a many-sided polygon; reticulations whitish, not very distinct. Color green, then pinkish yellow, finally gray before hatching; size .6 x .4 x .3 mm.

Stage I. Head pale yellow, ocelli black; round, slightly bilobed, no marks; width .3 mm. Body somewhat robust, not elongate, feet normal; ocherous yellow, all the tubercles distinct and broadly dark brown, large, bearing dark, swollen-tipped setae. Cervical shield not cornified, concolorous, the tubercles also brown and distinct as on the body; anal plate and anal leg plates triangular, dusky. Tubercle vi absent. The larvae spun up gregariously a silky web at the tip of a leaf and fed therein.

Stage II. Head rounded bilobed, shining pale yellow; width .5 mm. Body translucent yellowish, tubercles large, black; a broad, shaded, subdorsal black band and a faint, narrower dorsal one. Shields and feet pale; setae moderate, dusky.

Stage III. Head round, full, slightly bilobed, shining reddish orange; width 1.1 mm. (Calculated should be .9 mm.) Body thick, short, a little flattened; pale green with dorsal, addorsal and subdorsal broad, straight black lines with only narrow spaces between, the subdorsal broadest and edged with whitish below. Tubercles and spiracles black; cervical shield pale centrally, black at the sides; anal plate and large leg-shield black; setae short, pale.

Stage IV. Head as before, shining reddish orange; width 1.5 mm. Body as before, the dorsal and addorsal lines black, their narrow interspaces forming pulverulent yellowish white lines on the broad dark dorsum; subdorsal line reaches tubercle iii and is edged below by a suprastigmatal, narrow, yellowish line. Subventer dull yellowish with faint, pale, subventral line and rings about tubercles vii. Feet and venter pale, spiracles black ringed; anal plate and large anal leg-shields deep black; cervical shield red like the head, black on the lateral margins; tubercles black, moderate; setae rather long, fine, pale.

The larvae live till maturity gregariously within the leaves which they spin together and eat off the upper epidermis and parenchyma. Whole shoots may be thus spun up by one brood of larvae, the leaves turned brown and withered.

Two broods in the year. Winter passed as pupa in the ground. The larva is common in New York and New Jersey on the wild cherry (*Prunus serotina*), its only food plant. Were this plant of any economic importance, this Geometrid would be classed among the injurious species.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—IX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Therina athasiaria Walker. The moth was determined by Dr. Hulst.

The only reference to the early stages of this species is by Dr. Packard (*Therina seminudaria*, Rept. ent. U. S. dept. Agr, 1886, p. 329; 5th rept. U. S. ent. comm., p. 777), who describes a pupa and gives as food plant white pine. But as this is not the food plant of *T. athasiaria*, I doubted the determination. The doubt was confirmed by finding Dr. Packard's bred moth, with his label attached, in the National Museum. It proves to be *T. pellucidaria* G. & R. Therefore the early stages of *T. athasiaria* have not been previously referred to.

Egg. Elliptical, narrowing a little at one end, and smoothly truncate at the other, shining dark bluish green. The truncate surface is distinctly limited, and a little bulging centrally. Surface neatly reticulate in rounded areas, the reticulations not shiny, not elevated. Size .8 × .6 × .5 mm. The color changed to a gray green, and latter to sordid pink. Apparently laid in nature in the cracks of the bark. In confinement the moth deposited them between the cover and the glass, and under some paper lying in the bottom. The eggs hatched in ten days.

Stage I. Head large, round, dark brown, mouth region a little paler brown; setae short, stiff and pale, from minute dark tubercles; width about .35 mm. Body whitish, thorax and joints 10 to 13 dorsally, and circling bands on joints 4 to 9 dark red-brown. Smooth, no projections. The brown on the thorax is a slight shading, on joints 10 to 13 it is in dorsal and subdorsal bands; feet pale; no longitudinal bands on the central portion, except a very faint and slender brown lateral line which connects the transverse bands. The larvae were very active, and much annoyed by the presence of others of the same species, so that many died before a few were finally induced to feed.

Stage II. Head white, a little sordid, shaded with blackish at the vertex, and sides posteriorly; eyes black; with .6 mm. Body all opaque white, a little grayish, no marks, except a few tiny dark brown specks subdorsally centrally on the segments. In some, this forms a slender subdorsal line with a few faint dots besides. Tubercles brown; segments rather finely annulated. Setae short and pale.

Stage III. Head 1.0 mm. As before. Head white with many small brown-black specks; thicker at the sides posteriorly and in the sutures of clypeus; rounded bilobed, higher and wider than joint 2. Body pale gray with a slight greenish tint, obscurely longitudinally lined with several whitish lines, and sparsely black speckled. Tubercles i and ii, small subdorsal shades posteriorly on the segments, a subventral broken line, and medioventral dashes compose these speckles. Foot of joint 10, and sides of thorax darkly shaded. Anal plate rounded, not black marked. Setae obscure, pale. The larvae were still very active, and difficult to feed.

Stage IV. Head rounded bilobed, full, pale wood brown, faintly mottled with red brown, the upper tubercles black; width 1.4 mm. Body rather slender, smooth, pale greenish brown, faintly, finely, longitudinally lined with whitish, the tubercles rather broadly black marked. A subventral blackish shade line posteriorly. The pale lines are numerous, edged finely with dark brown, crinkly and a little mottled, some of the edgings broader and blacker than the others.

Stage V. Head whitish, mottled, dotted in patches with gray, tubercles and sutures of clypeus black; width 1.7 mm. Body greenish white, slightly tinged with brown, a little lined and marbled with brownish and gray, as before; tubercles black, setae pale. Shields concolorous with the body. Variation in color as in the next stage.

Stage VI. Head rounded, full, slightly bilobed, the clypeus small, somewhat depressed; width 2.2 mm. Whitish green with gray dottings over the lobes, tubercles represented by black spots. Body cylindrical, smooth, uniform, colored as before. The bred larvae were rather brightly colored. Ground color pale, nearly all whitish green, the black dashes heavy subdorsally intersegmentally; orange shading on the cervical shield, and in the subdorsal pale line, which is the only distinct line. The orange shadings are above the black dashes, which in turn border the pale line below. Anal plate orange shaded; tubercles represented by black spots. Another collected example was uniformly brownish, heavily mottled, only the subdorsal line, and a few streaks showing the whitish green ground color.

Food plant oak. The larvae are colored like the bark, and probably rest upon it. A single brood in the year, the winter passed as pupa. Larvae from Brookhaven, Long Island, N. Y. Eggs, June 12th, mature larvae not till late September or October; the development very slow.

The descriptions of the larvae of Therina are in some confusion. In the 5th report of the U. S. entomological commission are four descriptions, two of larvae on oak, and two on pine and spruce. I have shown above that the pupa described (p. 777) as "*seminudaria*" should be credited to *pellucidaria*, and probably the pupa described on p. 841 as "*fervidaria*" belongs to the same, judging from the food plant. On p. 186 "*fervidaria*" is described, possibly correctly; but more probably it is *fiscellaria* Gn., as the moths "reared from the live oak in Florida by Dr. Riley" (*i. e.* Mr. Koebele) are of that species, and Abbot's locality is southern. Following this is a description of "*endropiaria*," but obviously incorrect, as it differs totally from Goodell's correct one, which is referred to, without comment on the marked discrepancy. The description is taken from the books of the Department of Agriculture (no. 3904), and the bred moth before me proves it to refer to *fiscellaria* Gn.

The larvae of *pellucidaria*, *athasiaria*, *fiscellaria* (and *fervidaria* also?) are alike at maturity, within the normal range of variation, so that they cannot be distinguished with certainty. As to the earlier stages, I am not yet fully informed; but hope to be able to bring out the characters before this series of papers is closed.

The Name Leonia.—In Psyche, Oct., 1899, p. 416, I discussed Leonia, and its ally Hornia, without remembering that the name Leonia was proposed by Gray many years ago (1840) for a genus of Mollusca. There seems to be no alternative but to change the name of the meloid Leonia, so I will propose to substitute *Leonidia*, n. n. It is perhaps a matter of taste whether it is regarded as a distinct genus, or subgenus of Hornia.

T. D. A. Cockerell.

Correction of an Error.—In Psyche, vol. vii, p. 252 (June, 1895), I described an interesting Tineid larva, feeding on Rubus, as "*Butalis basilaris* Zell," depending upon the supposed accuracy of the determination made for me by Prof. C. H. Fernald. The name should be changed to *Schreckensteinia festaliella* Hübn. It will then not be an abnormality in the genus, the larva agreeing with the habits and appearance of the European form. (See Walsingham, Pter. Cal. and. Or., p. 1, 1880, and Meyrick, Handb. Brit. Lep., p. 690, 1895). I have not seen a previous record of the occurrence of this species in the East. Of the other species of Schreckensteinia, *felicella* Wals. is said to live on Orthocarpus and *erythriella* Clem. in the racimes of Rhus.

Harrison G. Dyar.

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PSYCHE.

ON THE MATING INSTINCT IN MOTHS.

BY ALFRED GOLDSBOROUGH MAYER, CAMBRIDGE, MASS.

[Annual address of the retiring president of the Cambridge Entomological Club, January 12, 1900.]

During the past summer the author carried out a series of experiments to determine the nature of the mating instinct of Callosamia promethea.

A large number of the cocoons of this moth were kindly collected for the author by W. L. Tower, Esq., in the neighborhood of Cambridge, Mass.; and others were found by the writer at Maplewood, N. J. Altogether 449 cocoons were obtained during the winter of 1898–99. These were allowed to remain out of doors in Cambridge where they were exposed to the winter's cold, and then on May 5th they were taken to Loggerhead Key, one of the Dry Tortugas Islands, Fla.

This situation was most favorable for the prosecution of the experiments, for the insect does not extend south of the Carolinas, and thus the moths were separated many hundreds of miles from others of their species. Moreover Loggerhead Key is a small sandy island, surrounded by many miles of ocean, and thus no interference with the experiments could come from the outside.

The cocoons were hung under the shade of some trees, where they were protected from the direct rays of the sun. It was remarkable that all but five of the moths (3 ♀ and 2 ♂) issued from the cocoons during the early morning hours between sunrise and eleven o'clock.

The following table will show the rate at which the moths issued from the cocoons:

Date.	No. of ♂♂	No. of ♀♀	Total.	Date.	No. of ♂♂	No. of ♀♀	Total.
M'y 18	1	2	3	J'ne 8	1	1	2
19	1	2	3	9	6	1	7
20	1	2	3	10	13	3	16
21	1	0	1	11	10	1	11
22	1	0	1	12	7	3	10
23	0	0	0	13	5	3	8
24	1	0	1	14	10	2	12
25	1	1	2	15	8	5	13
26	0	0	0	16	2	9	11
27	1	1	2	17	3	3	6
28	0	0	0	18	4	1	5
29	2	1	3	19	2	1	3
30	0	1	1	20	2	1	3
31	0	0	0	21	1	1	2
June 1	5	2	7	22	1	2	3
2	6	2	8	23	0	0	0
3	3	3	6	24	0	1	1
4	2	3	5	25	0	0	0
5	4	1	5	26	0	0	0
6	3	2	5	27	0	1	1
7	3	3	6	Total	111	65	176

It will be seen that 63% of the moths were males, and 37% were females.

As is well known, in this moth the wings of the female are reddish-brown in color, while in the male the wings are black; also the antennae of the male are large and bushy, while in the female they are small and slender. The male possesses the ability to seek out the female even though she be at a considerable distance. The males usually fly toward the females in the afternoon hours between two o'clock and sunset, and it is a common thing to observe several dozen males fluttering about the place where a female is resting. In seeking the female the male flies up against the wind until he comes into her near presence, and then he often flutters to and fro in a bungling manner that for want of better words we may designate as "stupid" and "aimless." Often he may fly into the immediate neighborhood of the female, and even then he will often flutter away without having made any attempt to mate with her. At other times, however, a male will fly at once to the female, and mate with her immediately.

After issuing from the cocoon the female commonly remains quiescent for some hours until she is fertilized, after which she flies actively about, and deposits her eggs. During her period of rest the female remains with her wings closed over her back, but when a male moth, or indeed any large object, comes near her within range of her vision she slowly and majestically opens and closes her wings several times. The males, when resting, react in a similar manner, but they are by no means so sensitive as the females. In captivity the moth lived from three to five days.

Observations and Experiments.

The first experiments were directed to determine whether the male was attracted by the sight of the female, or whether he merely perceived some odor which might emanate from her.

Five females were placed in a large clear glass battery jar, having a wide open mouth. The mouth was covered with coarse-meshed mosquito netting, thus allowing a free circulation of air between the interior of the jar and the outside. Five males were liberated about one hundred feet away from the jar, and immediately flew to it, and fluttered about the open mouth. The jar was then inverted (placed mouth downward) and sand was packed around the open end, so as to prevent any escape of air from the interior of the jar. The females thus remained visible through the clear glass sides of the jar, but no scent could come from them. Under these circumstances all of the males at once flew away, and soon disappeared from sight. When the jar was turned open end up again, however, all of the males reappeared, and flew excitedly around the mouth. This experiment was often repeated, and always with the same result. The males never pay the least attention to females which are enclosed in a hermetically sealed preserving jar of clear glass. Assuming that the males are able to see throı gh glass which appears transparent to us, we may conclude that sight alone is not sufficient to attract the male toward the female, or even so retain him in her presence when he is within a few inches of her.

Another experiment which seems to show that the male depends solely upon scent and not at all upon sight in seeking out the female, may be performed as follows: A female is wrapped in loose raw cotton so as to be invisible, and yet allow some scent to emanate from her. The males then fly to the cotton and crawl over it, fluttering their wings excitedly, and grasping the cotton repeatedly with their abdominal claspers.

In another series of experiments the females were inclosed within a wooden box having a paper chimney arising from one end, and the other end being open and covered with mosquito netting. This box was so arranged that a current of air blew in through the open end, and out of the paper chimney. The females within were invisible from the outside, and yet any scent arising from them would be carried up through the chimney into the outer air. When the males were liberated they flew to the mouth of the chimney and fluttered about in its neighborhood. None came to the large open end of the box into which the air was blowing. I then poured some CS_2 in a large flat evaporating dish and placed it near the open end of the box in such a manner that the fumes passed up the chimney and mingled with the scent from the female moths. The males, however, paid no attention to the new odor and still remained fluttering around the chimney; nor did they seem to be distracted by the fumes of ethyl mercaptan which possesses a most nauseating and putrid odor. Evidently the scent which arises from the female is sufficient to overcome the fumes of CS_2 or ethyl mercaptan, if indeed the males have any perception of the latter odors.

The entire abdomens of five females were cut off and placed upon a table, while the males were placed within a large mosquito-net cage about five feet away. Two males were liberated within five minutes of the time when the abdomens were cut off. They both flew to the recently severed abdomens and paid no attention to the abdomen-less females in the cage. I repeated this experiment many times but in all subsequent trials the males paid no attention either to the severed abdomens or to the mutilated females. As far as positive results go, however, it appears that the scent which attracts the male emanates from the abdomen of the female.

When the eggs are cut out from the female she no longer attracts males, nor do the males pay any attention to the detached eggs. Dead or dying females never attract males, nor do they come to the empty cocoon from which a female has issued.

When a female has remained for

some time in any place she seems to impart an odor to the locality, for males will continue to come to it for at least two hours after she has left.

It is interesting to notice that the females increase in attractiveness as they become older. This was repeatedly demonstrated as follows. Several females all of which were about six hours old were confined in a large cage made of mosquito netting, and which allowed a very free circulation of air through it. The same number of females about thirty hours old were placed in another similar cage about six feet away from the cage containing the younger females. Out of thirty-seven males, thirty-five came exclusively to the cage containing the older females. Of the other two males, one came to the cage holding the younger females and one divided his attention between both cages. When the females are reversed from one cage to the other the males still go to the cage containing the older females. Upon testing females thirty hours old against females fifty-five hours old, it appears that they are about equally attractive. Thus of seven males, three came to the cage holding the thirty hour old females, one divided his attention between both cages, and three came to the fifty-five hour females. It thus appears that females about six hours old are not so attractive as are females one or two days old.

Virgin females are more attractive than are fertilized females of the same age. When the virgins are confined in one cage and an equal number of fertilized females are placed in another cage about five feet away from the former, the majority of the males come to the cage holding the virgin females. Thus out of eleven males eight came to the virgin females, two to the fertilized females, and one to both cages. Fertilized females are still quite attractive to males, however, and the males will readily mate with them. This was first observed by Miss Caroline G. Soule, in 1894, who had two female promethea moths, each one of which was mated with four males and still they remained attractive to other males. In fact as long as she remains alive and in health the female attracts males to her.

One of my males mated four times with three females, and three others mated three times each. The males will make frantic efforts to mate with a female which is at the time coupling with another male.

The male will fly toward the female with normal eagerness even though his entire abdomen be cut off, and he will still seek the female when his abdomen is cut off, and the sides of his thorax are covered with impervious glue. It is therefore evident that the spiracles are not the seat of the organs by which the male perceives the female scent. If, however, the antennae of the male be covered with shellac, glue, paraffin, Canada balsam, celloidin, or photographic paste *, he no longer seeks the

* The photographic paste used in these experiments is sold in the market under the name of Stofford's white paste. Probably any impervious paste would serve as well.

female, and will display no excitement even though he be placed within an inch of her. In five instances I dissolved the photographic paste off in water, and in four of these cases the males readily mated with the females. Upon re-covering the antennae with the paste, however, the males again failed to display the least excitement when placed near the females.

There can be but little doubt that the organs by which the male perceives the female are situated in the antennae. Indeed, it has long been recognized that the olfactory organs of insects are found chiefly upon the antennae. Hauser, 1880, and Kraepelin, 1883, have given excellent descriptions of the minute anatomy of these organs, and Hauser has carried out an elaborate series of the physiological experiments to determine their function. He cut off the antennae of a number of species of insects, and found that their sense of smell was then either greatly impaired or totally lost. Covering the antennae with melted paraffin gave the same results. Hauser also found that when the antennae of the male Saturnia pavonia were removed the moth never makes any attempt to mate.

Packard, 1898, gives an excellent review of all researches relating to the anatomy and physiology of the olfactory organs in insects.

If the eyes of a male Callosamia promethea be covered thickly with pitch or Brunswick black * so as to preclude the possibility of sight remaining, the male will still mate in a normal manner if he be placed near the females.

It will be remembered that in this moth the male is black in color, while the female is reddish brown, and in accordance with the well known theory of Darwin the peculiar coloration of the male might be due to sexual selection on the part of the female. We might suppose, indeed, that the females preferred dark colored males, and thus under the influence of sexual selection the males became darker and darker until the present melanic coloration had been attained. In 1897 the author showed that the melanic coloration of the male of this moth is phylogenetically newer than the color pattern of the female, and this fact, as far as it goes, lends support to this theory of Darwin's. In order to test this hypothesis I cut off the wings of a number of females leaving only short stumps from which all the scales were carefully brushed. Male wings were then carefully glued to the stumps, and thus the female presented the appearance of a male. Under these circumstances the males mated with the females quite as readily as they would have done under normal conditions. I then tried the converse experiment, and glued female wings upon the males. Here again, however, the mating seemed to occur with normal frequency, and I was unable to detect that the females displayed any unusual aversion toward their effeminate looking consorts. It is also interesting to observe that normal males pay no attention to

* This substance is commonly used as a microscopic cement, and is of a pitchy consistency and a dense brown-black color.

the other males who display female wings. In another series of experiments the wings were cut entirely off of both males and females, and also all of the scales were brushed off their bodies; and yet these shabby looking males were readily accepted by normal females, nor could I see that normal males displayed any aversion to mating with the wingless females. We are, therefore, forced to conclude that the melanic coloration of the male has not been brought about through the agency of sexual selection on the part of the female. In this connection it is interesting to notice that Plateau, 1897, concludes that insects are attracted only by the odor of flowers and not at all by their color.

In conclusion it gives me great pleasure to express my gratitude to Miss Caroline G. Soule for advice and aid; to W. L. Tower Esq. for his kindness in collecting many cocoons of the moth; and to Dr. Robert W. Fuller who provided me with reagents used in the manufacture of ethyl mercaptan.

Summary of Conclusions. — The male is positively chemotactic toward some substance which emanates from the abdomen of the female, and which he perceives through olfactory organs situated upon his antennae.

Females 30–60 hours old are much more attractive to males than are young females 5–10 hours old. Virgin females are somewhat more attractive than are fertilized ones of the same age.

The male will mate at least four times either with the same or with different females.

Neither males nor females pay any attention to the appearance of their partners. The melanic colors of the male have not been brought about through sexual selection on the part of the female.

LITERATURE QUOTED.

Hauser, G. 1880; Zeitschrift für wissen. Zool., Bd. xxxiv, p. 367–403, 3 Taf.

Kraepelin, K. 1883; Ueber des Geruchsorgane der Gliedertiere, 48 pp. 3 Taf., Hamburg.

Mayer, A. G. 1897; Bulletin Museum Comp. Zool. at Harvard Coll., Vol. xxx, p. 178–180, Pl. 3, Figs. 24–41.

Packard, A. S. 1898; A Text-Book of Entomology, p. vi + 729, 654 Figs. Macmillan & Co.

Plateau, F. 1897; Bull. Acad. Roy. Sci. Belgique, Tom. xxxiv, p. 601–644, 847–880.

Soule, Caroline G. 1894; Psyche, The journal of the Cambridge Entomological Club, Vol. 7, p. 155.

Harvard University,
Cambridge, Massachusetts.

ENTOMOLOGY FOR THE YOUNG. — Ginn and Co. of Boston have just issued a second series of Stories of Insect Life, by Mary E. Murtfeldt and Clarence Moores Weed, intended for children. It is a little reading book of 72 pages, well illustrated, and in its few chapters ranges a wide field.

A considerable portion of Blatchley's Gleanings from Nature (The Nature Publishing Co., Indianapolis), intended to awaken an interest in nature in the youth of Indiana particularly, is devoted to insects and especially to Orthoptera. A good many interesting facts may be found in it.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—X.

BY HARRISON G. DYAR, WASHINGTON D. C.

Therina pullucidaria G. & R. A moth was submitted to Dr. Hulst for determination. The larva is previously undescribed, though the pupa has been described by Dr. Packard (5th rept. U. S. ent. comm., 777, as *seminudaria*). In the following there is a small chance for error. The eggs and stage I were obtained from a moth of *pullucidaria*, but the larvae would not feed. (They were not given pine, as I did not know their food plant at the time.) The rest of the life history is from larvae collected on pine, but not bred. However, I have a moth bred from pine by Dr. Packard, establishing the food plant.

Egg. Roundly elliptical, flattened above and below, a little wedge shaped from side view, perfectly rounded; one end truncate, the truncate part bulging in its center. Neatly reticulate, the cell areas flattened. Pale green, somewhat grayish, shining. Size .8×.6×5 mm. Laid singly in captivity. Eggs found in nature were laid on a needle of the pine in a row of two layers, seven in the lower layer, three in the upper one.

Stage I. Head round, brown black, clypeus pale; width about .35 mm. Body slender, normal white, with five smoky, brown-black, transverse bands on joints 5 to 9 and slight narrow ones on joints 2 to 4; feet pale. Very similar to *T. athasiaria*, but the color of the bands is not quite so dark and they are a little broader and connected by a narrow dark lateral line in that species.

Stage II. Head rounded, brown black, a little mottled with pale; width .55 mm. Body pale brown with longitudinal dark brown lines, distinct in a broad lateral band, leaving the dorsum broadly pale and the subventral fold distinctly so. Venter indistinctly lined. Tubercles i and ii slightly brown marked; feet all brown. A pale subdorsal line is seen, edging the brown above. Rather slender, smooth.

Stage III. Head whitish brown, a brighter line on the face of each lobe, brown only narrowly in the sutures and on the posterior edge; width .8 mm. Body light sordid green, faintly, finely lined with pale, the subdorsal line most distinct. Dorsal space crossed by dorsal and addorsal lines, tubercles i and ii not contrasted. Lateral band double, consisting of a shade below the subdorsal line, a few dots, dark spiracles and a subventral line; venter obscurely lined and with dark medio-ventral patches. Feet pale; a heavy dark subdorsal spotting on thorax.

Stage IV. Head round, bilobed, whitish, dotted thickly with pale brown on the upper half and a few dark brown dots at eyes and apex of clypeus; width 1 mm. Body pale wood brown, almost whitish, finely longitudinally lined. Dorsal space with three pale brown, and four whitish lines; a subdorsal row of streaks with slight irregular marks below and dark spiracles; a narrow subventral line. Ventral lined like the dorsum, pale brown and whitish, and a medio-ventral series of large dark brown spots. Feet pale.

Stage V. (abnormal, interpolated) Head 1.2 mm. Coloration as in the next stage.

Stage V. (normal) Head rounded bilobed, full; pale greenish, the tubercles and sutures marked with brown; width 1.6 mm. Body smooth, uniform, pale green, a little whitish, subdorsal line obscure, whitish; dorsal space with faint pale brown linings, lateral region somewhat more distinctly so, appearing darker, and giving the dorsum a flattened look. Spiracles and tubercles iv dark. Venter faintly marked, like the dorsum, all the markings light. Feet pale.

Stage VI. (abnormal interpolated) Head 1.85 mm. Coloration as in the next.

Stage VI. (normal) Head whitish, blackish dotted, strongest in vertical suture, tubercles black; width 2.2 mm. Body pale yellowish green, approaching white, marked essentially as in *T. athasiaria* and *T. fiscellaria* and scarcely distinguishable from them. A distinct subdorsal line of the ground color; dorsal space faintly lined with brown, irregular and crinkly; tubercles dark. Sides, to below subventral fold, with similar lines, but black and distinct, especially a geminate lateral one; subventral fold pale; spiracles black. Venter pale with a pair of faint lines. Feet and the cervical shield orange tinted, except the anal feet.

Food plant yellow pine. Larvae from Brookhaven, Long Island, N. Y. Eggs June 17th, mature larvae in September, the winter doubtless passed as pupa. Single brooded. This larva differs from *T. athasiaria* in food plant and manner of egg-laying. The larva assumes the mature coloration at once in stage II, without any intervening pattern. The specimens before me grew very slowly and not vigorous, as shown by its having eight stages instead of the normal. It failed to pupate.

THE FIFTH SPECIES OF KERMES FROM MASSACHUSETTS.

Kermes andrei n. sp. ♀ scale pyriform in shape, very convex, 5 mm. high and 5 mm. in diameter at its base, variable in some individuals which are nearly hemispherical. Surface shiny. Color, light brown, with three and sometimes four, very dark brown bands, these variable in length and breadth. There are also several suffused dark brown blotchy spots and round dots, more numerous around the posterior cleft. Segmentation obscure; a median posterior keel-like prominence, which is very much wrinkled above near the region of the posterior cleft. When boiled in K. H. O. the dermis is colorless. Rostral loop dark yellow, stout, not very long. No antenna of legs observed. The larvae which were formed in the body of the ♀, are yellow, elongate oval, 360 micromillimeters long, 160 broad. Antenna 6 segmented, 3 and 6 about equal and longest; 1 next, then 2 and 5 which are equal; 4 is the shortest. Formula (36) 1 (25) 4 Antennal segments–(1)20(2)16(3)24(4)12(5)16(6)24. Segments 4. 5 and 6 have a few short hairs. Legs short and stout. Femur with trochanter 76 long. Tibia with tarsus 68 long. Tarsal digitules long fine hairs with knobs: digitules of claw reaching a little beyond the claw. Caudal tubercles quite large, each bearing one long stout bristle (120 long), and three long stout spines (28 long). The marginal spines point backwards and about the same in length and breadth as those on

Kermes andrei.

the caudal tubercles. Rostral loop reaching beyond last pair of legs. Eggs oval 320 long, 240 broad.

Hab. — Lawrence, Mass., on white and red oaks, Sept. 9, 1899. Associated with *Kermes galliformis*, and found singly, not in clusters as in the latter. They are not common and the species seems to be viviparous.

I am pleased to name this coccid in honor of Mr. Ernest André of Gray, France, who has shown me many favors in the study of Formicidae. This species appears to be very distinct from all American Kermes. It looks rather like the European *K. gibbosus*, but is not the same. It is also different from the other European species. *K. pettiti* Ehrh. is somewhat similar, but is evidently distinct, being smaller, redder, with spots instead of bands. Cockerell in litt. Nov. 18, 1899.

Geo. B. King.

Lawrence, Mass.

PROCEEDINGS OF THE CLUB.

8th December, 1899. The 210th meeting was held at 156 Brattle St., Mr. W. L. W. Field in the chair.

Mr. R. Hayward remarked at some length on the results of a recent study of the North American species of Tachys, which will form the subject of a paper soon to be published in the Transactions of the American Entomological Society. Figures were shown illustrating the more important characters.

Mr. S. H. Scudder read extracts from a letter of Mrs. A. T. Slosson mentioning her discovery of *Gryllus luctuosus* on or near the summit of Mt. Washington, N. H.

He also showed specimens of the dark form of the mature larva of *Papilio polyxenes* recently described in Psyche by Miss C. G. Soule, remarking that it was virtually an extension of the coloring of the fourth stage into the fifth, and by the closure of the yellow spots on the dark ground (normally open in front) recalled strikingly the markings of the European species, *P. machaon*, also exhibited.

He further called the attention of the Club to the striking differences between the Orthopteran fauna of Europe and the United States. Of our 205 recognized genera, only 26 occurred in Europe, and half of these were cosmopolitan.

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PSYCHE.

THE ORTHOPTERAN GENUS TRIMEROTROPIS.

BY JEROME MCNEILL, STANFORD UNIVERSITY, CAL.

I have recently finished a revision of Trimerotropis Stål and as its publication is likely to be somewhat delayed it has been thought best to publish the key with brief notes on the most important synonomy and the localities of the species. Through the kindness of the National Museum, Dr. Scudder and Dr. Bruner I have been able to study the types or typical specimens of all the species described in this country except only *Tr. thalassica.* The type of this species should be in the National Museum but I have not been able to find it there. I have not been able to examine Saussure's types but with a few exceptions I have satisfactorily determined his species. The genus is one of the largest and most difficult of Orthoptera but with a single exception it contains species of little economic importance.

KEY TO TRIMEROTROPIS.

A[1]. Tegmina plain isabelline, not banded and with spots not segregated into groups extending across the wing. Frontal costa* sulcate as strongly above as below the ocellus, its carinae continuous with the carinae of the vertex. Pronotum with the disk flat. Area of the cubital forks narrow and with few exceptions occupied wholly or in part by a single row of quadrate cells. Wings always long with the disk greenish yellow or hyaline throughout. Posterior tibiae never blue. . . . . AGONOZOA subg. n.

a[1]. Lateral lobes of the pronotum with a dentation on the posterior part of the lower border.

b[1]. General color pale testaceous, very plain. Wings transparent without a trace of a fuscous band. Tegmina without bands and with a very few spots restricted almost entirely to the middle field. Posterior femora light on the

---

* *Tr. coquilletti* has the frontal costa mostly solid above the ocellus.

inner face with the usual black bands obsolete. . . HYALINA GROUP.
Hyalina n. sp.

b ². General color isabelline. Wings with a definite fuscous band or at least with plain indications of such a band in the infuscated nerves of the region usually occupied by the band. Pronotum with a definite stripe extending along the sides of the disk or at least with the edges lighter than the middle.
TEXANA GROUP.

c ¹. Prozone of the pronotum bilobate when seen from the side. Median carina a raised line on the metazone.

d ¹. Process of the metazone acutangulate. Metazone twice as long as the prozone. Fuscous band of the wings broad. Posterior tibiae dull orange. . . . . *Texana* Brun.

d ². Process of the metazone obtusangulate. Metazone not more than one and three quarter times as long as the prozone. Posterior tibiae obscure greenish.

e ¹. Smaller, ♂ 15 mm., ♀ 22 mm. long. Crest of the prozone divided into dentiform lobes. . . . . *Rebellis* Sauss.

e ². Larger, ♂ 19–23 mm., ♀ 27–30 mm. long. Crest of the prozone divided into rounded lobes.

f ¹. Posterior lobe of the crest of the prozone plainly not so high as it is long. Posterior femora very distinctly banded on the outer face, lower sulcus light colored with two black bands.
Albolineata Brun.

f ². Posterior lobe of the crest of the prozone as high as it is long. Posterior femora indistinctly banded on the outside, lower sulcus black with two light bands. . . . . . *Cristata* n. sp.

c ². Prozone of the pronotum not bilobate when seen from the side, and barely intersected by the sulcus and therefore straight and barely perceptibly notched Median carina cristate on the metazone and nearly as high as on the prozone. . . . . *Porrecta* n. sp.

a ². Lateral lobes with no dentation on the posterior part of the lower border, or if there is a blunt tooth present, the fuscous band is weak or interrupted and the pronotum has no definite stripe along the lateral edges of the disk nor is the middle darker than the lateral borders. . . . MARITIMA GROUP.

b ¹. Area of the cubital forks of the tegmina occupied by more than one row of irregular cells.

c ¹. Wings with the median and cubital areas about equal. Larger, ♂ 26 mm., ♀ 34 mm. long. North American. . . *Maritima* Harr.

c ². Wings with the median and cubital areas very unequal. Smaller, ♂ 22 mm., ♀ 28 mm. long. Chilean . . *Ochraceipennis* Blanch.

b^2. Area of the cubital forks of the tegmina narrow, occupied by a single row of subquadrate cells. Lower sulcus of the posterior femora black with a single preapical light band.

c^1. Median carina of the metazone somewhat cristate. Fuscous band of the wings indicated only by infuscated veins or at most incomplete and continued on the posterior margin less than half way to the anal angle, spur extending more than half way to the base. . . . *Gracilis* Thos.

c^2. Median carina of the metazone distinct but merely a raised line. Fuscous band of the wings distinct and uninterrupted, continued on the posterior border much more than half way to the anal angle, spur extending less than half way to the base. . . . . . *Coquilletti* n. sp.

A^2. Tegmina fasciate, with solid well defined bands reaching at least half way across the wing from the anterior margin, or by the segregation of annular spots, fasciae sometimes faint on account of the slight contrast between them and the ground color. Rarely the tegmina are not fasciate, then they are evenly maculate with fuscous annuli and the wings are broad with the apical halt fuscous or fuliginous. Frontal costa generally sulcate above the ocellus for a short distance only, below the vertex rounded and punctate. Pronotum with the disk usually elevated and subtectiform on the prozone. Area of the cubital forks broad, occupied by several rows of irregular cells . . TRIMEROTROPIS subgenus.

a^1. Wings with the disk yellow or green, never blue and never without a fuscous band or cloud.

b^1. Hind tibiae never blue. Tegmina with the basal and median bands solid, approximately equal to each other and to the light bands just beyond with which they alternate, and confined to a little more than the anterior half . . . . CINCTA GROUP.

c^1. Front of the head with two black bands extending between the eyes. one above and one below the basal joint of the antennae. *Cincta* Thos.

c^2. Front of the head with no black bands extending between the eyes *Juliana* Scudd.

b^2. Hind tibiae frequently blue. Tegmina not as in the alternative.

c^1. Tegmina * fasciate through the uneven distribution of maculations or by well-defined clouds or bands. If the tegmina are the first kind then the outer half of the wing is not infuscated and the lower sulcus of the hind femora are black with a single preapical light-band.

d^1. Posterior tibiae blue . . . . . COERULEIPES GROUP.

e^1. Lateral lobes of the pronotum with the posterior angle rounded,

* *Tr. agrestis* with a broad fuscous band and red hind tibiae must be included here though the tegmina are almost destitute of spots.

without a downward projecting tooth. Disk of the wings greenish or yellow.

f^1. Lower sulcus of the posterior femora black with a single pre-apical light band.

g^1. Wings with the apical half hyaline, neither fuscous nor fuliginous except at the extreme tip. Bands of the tegmina plainly formed by the aggregation of smaller maculations.

Caeruleipes Scudd.

g^2. Wings with the apical half fuliginous and fuscous, nowhere entirely hyaline. Basal and median bands solid and well-defined at least on the anterior half.

h^1. General color light, punctate with fuscous. Tegmina conspicuously fasciate and punctate with fuscous. Disk of the wings semiopaque, yellowish green, beyond mostly fuscous. . . . . *Tessellata* n. sp.

h^2. General color fuscous, nearly plain. Tegmina plain fuscous with two pale bands. Wings with the disk transparent greenish yellow, beyond mostly fuliginous. *Caliginosa* n. sp.

f^2. Lower sulcus black with two light bands on the apical half, or (through the fading of the fuscous base) light with one preapical black band.

g^1. Ground color white. Tegmina white with three narrow black bands. Scutellum of the vertex very shallow with a very indistinct median carina . . . . *Albescens* n. sp.

g^2. Ground color brown or gray never white and with only the basal and median bands well defined.

h^1. Scutellum of the vertex with a median carina. Posterior field of the tegmina not plain, with spots or fascia.

i^1. Bands of the tegmina not weakening posteriorly, in the posterior field not broken up into spots. Scutellum of the vertex no longer than broad even in the male.

Bifasciata Brun.

i^2. Bands of the tegmina weakening posteriorly, in the posterior field broken up into spots. Scutellum of the vertex much (♂) or a little (♀) longer than broad.

Ferruginea n. sp.

h^2. Scutellum of the vertex deeply sulcate with no median carina. Posterior field plain without spots or fascia.

Koebelii Brun.

e^2. Lateral lobes of the pronotum with the posterior angle furnished with a minute downward projecting tooth. Disk of the wings sea-green . . . . *Thalassica* Brun.

d^2. Posterior tibiae red or orange.

e^1. Lateral lobes of the pronotum without a tooth on the posterior part of the lower border.

f^1. Scutellum of the vertex moderately broad but plainly less than the short (♂) or long (♀) diameter of the eye. Posterior femora with the disk of the inner face yellow or red with three black bands, one apical, one preapical and one median, the latter may extend, as a stripe, toward the base, but the immediate base is very rarely black, rarely the whole inner face may be suffused with fuliginous, obscuring the markings. CITRINA GROUP.

g^1. Disk of the metazone of the pronotum plainly lighter than the prozone, generally reddish brown in color and smooth except for a few large scattered generally black granules. Posterior femora chiefly red on the inner side.

h^1. Lower sulcus as well as the inner face chiefly red with no fuliginous suffusion obscuring the fuscous bands or spots. *Monticola* Sauss.

h^2. Lower sulcus of the posterior femora black or fuliginous. Median carina slight but distinct. . *Campestris* Brun. Ms.

g^2. Disk of the metazone not as in the alternative.

h^1. Median and basal bands of the tegmina solid and not plainly formed by the grouping of spots.

i^1. Bands of the tegmina conspicuous.

j^1. Process of the metazone acute.

k^1. Median carina of the scutellum of the vertex distinct . . . . *Bruneri* n. sp.

k^2. Median carina wanting. . *Fascicula* n. sp.

j^2. Process of the metazone decidedly obtuse. *Praeclara* n. sp.

i^2. Bands of the tegmina dim, color testaceous, plain. Metazone with its process acute. . . *Modesta* Brun.

h^2. Median and basal bands of the tegmina obviously made up of fuscous annuli. Process of the metazone obtuse. *Citrina* Scudd.

f^2. Scutellum of the vertex equalling the short (♂) or long (♀) diameter of the eye. Posterior femora with the disk of the inner face black with one or two light bands on the apical half. Fuscous band of the wings at least one fourth the length of the wings in width. . . . . LATIFASCIATA GROUP.

g^1. Posterior femora with two light bands on the inner face. Process of the metazone obtusangulate with the tip rounded.

h^1. Median carina of the scutellum of the vertex wanting. Median carina of the metazone of the pronotum elevated and very distinct . . . . . *Latifasciata* Scudd.

h^2. Median carina of the scutellum of the vertex distinct. Median carina of the pronotum nearly obsolete on the metazone . . . . *Laticincta* Sauss.

g^2. Posterior femora with one light band on the inner face. Process of the metazone of the pronotum acutangulate with the tip sharp.

h^1. Basal half of the wings yellow.

i^1. Outer half of the wings infuscated. *Tolteca* Sauss.

i^2. Outer half of the wings not wholly infuscated but the apical hyaline part nearly as broad as the fuscous band. *Pistrinaria* Sauss.

h^2. Basal one sixth of the wings yellow, apical one sixth hyaline, remaining two-thirds occupied by the fuscous band. *Melanoptera* n. sp.

e^2. Lateral lobes of the pronotum with a tooth on the posterior part of the lower border. . . . . . CALIFORNICA GROUP.

f^1. Tegmina conspicuously banded or at least with the fuscous punctations well separated into three groups.

g^1. Pronotum with a light stripe on either side of the disk. Fuscous band of the wings narrow, about one seventh of the length of the wing in width. . . . *Californica* Brun.

g^2. Pronotum quite plain on the disk. Fuscous band of the wings broader, one sixth or one fifth the length of the wing in width.

h^1. Metazone of the pronotum twice as long as the prozone, with the process acutangulate. . . . *Strenua* n. sp.

h^2. Metazone of the pronotum once and a half as long as the pronotum with the process obtusangulate *Montana* Brun. Ms.

f^2. Tegmina with scarcely a trace of the usual bands, but with a few scattered spots on the basal half, the rest almost plain. *Agrestis* n. sp.

d^3. Posterior tibiae yellow green or brown.

e^1. Lateral lobes of the pronotum with a tooth on the posterior part of the lower margin. . . PACIFICA GROUP. *Pacifica* Brun.

e^2. Lateral lobes of the pronotum without a tooth. Tegmina distinctly or conspicuously banded except sometimes in dark colored specimens, where the contrast may be slight; fascia large and though irregular in shape semisolid and something more than aggregations of fuscous spots. Wings yellow or greenish yellow at the base with a distinct fuscous band. Posterior femora with the disk of the inner face black with two light bands. . . . VINCULATA GROUP.

f^1. Lower sulcus of the posterior femora light with one preapical black band or black with two light bands, one preapical and one median, the latter not merely interrupting the black on the edges of the sulcus but in the bottom as well.

g^1. Fuscous band in its usual position in the middle of the wing. Spur extending less than half way to the base. General color dark fuscous brown permitting little contrast in the bands of the tegmina.

h^1. Metazone scarcely more than one and a half times as long as the prozone. Fuscous band of the wings very broad occupying nearly one third the length of the wings. *Salina* Brun. Ms.

h^2. Metazone twice as long as the prozone. Fuscous band rather narrow, occupying no more than a sixth or seventh the length of the wings. . . . . . *Similis* Scudd.

g^2. Fuscous band entirely beyond the middle of the wing, making the length of the disk equal to the width, fuscous spur extending more than half way to the base. Bands of the tegmina contrasting strongly with ground color and very conspicuous.

Pallidipennis Burm.

f^2. Lower sulcus of the posterior femora black with one preapical light band.

g^1. Posterior tibiae yellow or greenish, never brown.

h^1. Pronotum unusually short not (♀) or a very little (♂) longer than wide. Size small, less than 20 mm. (♂) or about 25 mm. (♀). . . . . *Collaris* n. sp.

h^2. Pronotum not unusually short, considerably longer than wide even in the female.

i^1. Fuscous band very narrow and interrupted, spur acute extending more than half way to the base. Process of the metazone acute. Size small, 20 mm. (♂), 25 mm. (♀).

Fratercula n. sp.

i^2. Fuscous band broad or when narrow distinct and uninterrupted.

j^1. Metazone twice as long as the prozone with the process acute. Wings long, barely less than twice as long as wide. Fuscous band narrower, at most not exceeding one sixth the length of the wing. Lower sulcus of the posterior femora with the black not almost severed by the median light band . . . *Vinculata* Scudd.

j^2. Metazone less than one and three quarter times as long as the prozone, with the process rectangular. Wings shorter, being considerably less than twice as long as wide. Fuscous band equal in width to a fourth or a fifth the length of the wing. Lower sulcus of the posterior femora with the black almost severed by the median light band . . . . *Saxatilis* n. sp.

g^2. Posterior tibiae brown with a pale subbasal annulus. Size small. Wing very broad, less than one and one half times as long as broad . . . . *Pilosa* n. sp.

c^2. Tegmina thickly punctate with evenly scattered fuscous annuli, contrasting little with the fuscous background and not or very rarely collected into groups forming bands. Wings broad with the outer half infuscated or fuliginous, rarely only the tip of the apical part and the veins beyond the fuscous band are infuscated. . . . . . FALLAX GROUP.

d^1. Posterior tibiae blue with a light sub-basal annulus or at least a brownish spot on the exterior face.

e^1. Tegmina evenly maculate with at the most faint traces of bands. Process of the metazone acutangulate at least in the male.

Fallax Sauss.

e^2. Tegmina plainly fasciate by the unequal distribution of fuscous annuli. Process of the metazone obtusangulate even in the male.

Nubila n. sp.

d^2. Posterior tibiae not blue and without a pale sub-basal annulus.

e^1. Portion of the wing beyond the fuscous band either fuscous or fuliginous, spur reaching half way to the base. *Conspersa* n. sp.

e^2. Portion of the wing beyond the fuscous band hyaline, spur reaching two thirds the distance to the base. *Variegata* n. sp.

a^2. Wings entirely hyaline without fuscous band and colored disk or the latter blue with the fuscous band distinct or indicated by infuscated nerves and cells. Fascia of the tegmina never solid but obviously made up of fuscous annuli often imperfectly segregated.

b^1. Fuscous band present. Disk blue. Posterior tibiae blue with a light sub-basal annulus . . . . CAERULEIPENNIS GROUP.

c^1. Prozone of the pronotum strongly elevated and bilobate. Disk of the wings faintly tinged with blue. Fuscous band narrow and indistinct. *Caeruleipennis Brun.*

c^2. Prozone of the pronotum very little elevated and scarcely bilobate. Disk of the wings deep blue. Fuscous band broad and distinct. *Cyaneipennis* Brun.

b^2. Fuscous band wanting. The wing entirely hyaline. Posterior tibiae obscure greenish or brown. Posterior femora with the disk of the inner face black with two light bands on the apical half. Lower sulcus light with one preapical black band. . . . . . . AZURESCENS GROUP.

c^1. Scutellum of the vertex broad, scarcely longer than broad and about equal in width to the diameter of the eye as seen from above. Process of the metazone acute . . . . . . *Azurescens* Brun.

c^2. Scutellum of the vertex narrow, plainly longer than broad and much less than equal in width to the diameter of the eye as seen from above.

d^1. Process of the metazone rounded. Basal fuscous band distinct from the fuscous points of the immediate base. Larger, male more than 20 mm. long . . . . . *Pseudofasciata* Scudd.

d^2. Process of the metazone sharp. Basal fuscous band of the tegmina not distinct from the spots of the immediate base. Smaller, male less than 20 mm. long . . . . *Lauta* Scudd.

Of the fifty-four species enumerated in the preceding key twenty-four are new. Sixteen species are confined to California as follows: *hyalina*, *rebellis*, *albolineata*, *porrecta*, *coquilletti*, *caliginosa*, *albescens*, *koebelei*, *thalassica*, *californica*, *pacifica*, *pilosa*, *fallax*, *conspersa*, *variegata*, and *pseudofasciata*. Three others are confined to the Pacific coast within the United States: *caeruleipes*, *bifasciata* and *similis*. Three are found east of the Mississippi: *maritima*, *saxatilis* and *citrina*. The last mentioned extends from the Rocky Mountains to Maryland. The first mentioned is restricted to the Atlantic coast and the shores of the Great Lakes and *saxatilis* is found in northwest Arkansas and southern Illinois. Five species are not found within the limits of the United States. These are *tolteca*, *ochraceipennis*, *pallidipennis*, *lauta* and *collaris*. The remaining species, twenty-seven, belong to Rocky Mountain States. *Monticola* extends from Colorado into Mexico and *pistrinaria* from Texas into Mexico. *Cincta* ranges from California to Texas. *Texana* ranges from Texas to New Mexico; *cristata* from Lower California to Salt Lake Valley, Utah; *latifasciata* from Utah to Washington; *caeruleipennis* from California to Wyoming. Three species, *salina*, *agrestis*, *praeclara* are confined to Nebraska; three also, *nubila*, *modesta* and *melan-*

optera to New Mexico; two, *frater-cula* and *campestris* to Wyoming.

The changes in synonomy are not great, a few of the most important may be noted. I have considered *fontana* Thos. as synonym of *juliana* Scudd. *Cincta* Thos. is not the species as understood by Saussure and others, which was probably *vinculata* Scudd. I have considered *perplexa* Brun. a synonym of *azurescens* Brun.

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A NEW BLEPHAROCERID.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIF.

The family of Blepharoceridae, as at present known, includes about fifteen species of nematocerous Diptera, of unusual interest to entomologists. This interest is caused by the rarity of specimens in collections, by the unique structural condition of the larva, by the strange, although as yet imperfectly known, life history and habits, and finally by the peculiar accessory venation and suggestive structural character of the mouthparts and *compound eyes of the imagines.

In the summer of 1895, Mr. R. W. Doane, at that time collecting for me in the vicinity of this University (Stanford), took two females and a male of a Blepharocerid species. I have only recently given these specimens any attention other than the rather unkind one of removing the heads of two (the male and one female) in order to study their mouthparts. A recent examination of the specimens reveals the fact that they are representatives of an undescribed species which may be assigned to Löw's genus Liponeura (Stett. Ent. Zeit. 1844, vol. v, p. 118).

*See Kellogg, Notes on the Life-history and Structure of Blepharocera capitata Löw; Ent. News, 1900, vol. X, pp. 305-318.

The new species may be described as follows:

Liponeura doanei n. sp. Female; length 6 mm., length of wing 7½ mm.; very pale brown, almost clayey; antennae 14-segmented and rising from a prominence which

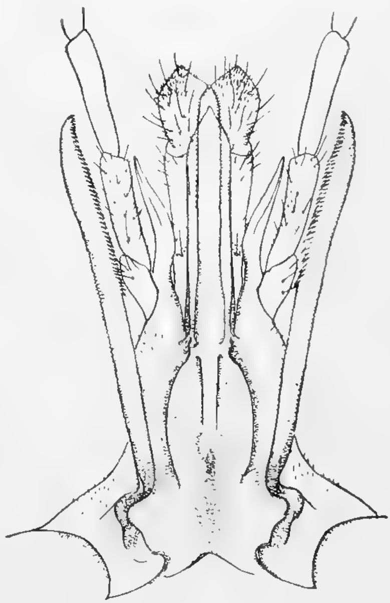

Fig. 1. Mouthparts of *Liponeura doanei* n. sp.

might be construed to be a basal antennal segment; eyes broadly separated, and with no indications of bisection, the facets being all of the same size; the mouthparts (fig. 1) long (distinctly longer than in Blepharocera, for example) and composed of long slender flattened well chitinized mandibles with the apical two-fifths of the inner margin finely serrate, and inserted farther back on the head than the other mouthparts; of maxillae consisting of slender flattened tapering blade-like terminal lobes and long five-segmented palpi; of elongate simple labium consisting of basal portion and one pair of free terminal lobes; and of slender elongate flattened labrum-epipharynx and hypopharynx; wings with venation (fig. 2) showing the following characters (given first in the nomenclature used by Comstock and in following parentheses in the nomenclature used by Osten Sacken in the latest revisional paper

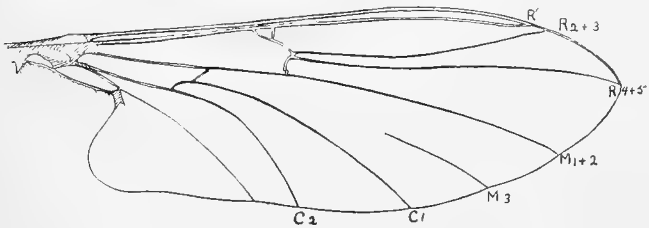

Fig. 2. Venation of *Liponeura doanei* n. sp.

of the Blepharoceridae); vein M_3 independent, i. e. without connection with M or any other principal vein (an incomplete vein running into the posterior margin between veins 4 and 5); veins R_2 and R_3 coalesced to the margin (vein 2 simple, unbranched); a medio-cubital cross vein (a cross-vein between veins 4 and 5); veins R_2+_3 and R_4+_5 separating at the origin of the radio-medial cross vein (the sub-marginal cell sessile); the radial sector springing from R by two roots (the cross vein between veins 1 and 2 Y-shaped, that is the anterior half of it divided, enclosing a small triangular cell); sub-costa wanting or with only a basal rudiment present (auxiliary vein wanting or with only a basal rudiment present). Wings clear, with strong iride scent reflections. The legs are long, the three pairs of about equal length, the hind tibiae bearing a single terminal spur, the other tibiae without spurs. The tarsal claws are large, thick and strong with curved pointed tip, thickly pectinate except at the tip. The external genitalia consist of a pair of flattened triangular dorsal plates.

Male. The male is slightly smaller than the female. As the head of the only male specimen was destroyed in the dissection of the mouthparts before any examination of the specimen was made, it cannot be said whether the eyes are like those of the female or not; mouthparts like those of the females except that the mandibles are wholly lacking. Wings and legs like female. The conspicuous parts of the external genitalia are a pair of large articulated claspers, a broad ventral plate, and a smaller dorsal plate.

Described from two females and one male, taken by R. W. Doane, July 24, 1895, on the banks of a small stream in the Santa Cruz Mts. at Congress Springs, Santa Clara County, California.

The new species can readily be grouped with the four other known species assigned to the genus Liponeura in Osten Sacken's* paper. The new form has in common with the other four species an incomplete vein running into the posterior margin of the wing between veins 4 and 5, a simple (un-

*Osten Sacken C. R. Contributions to the study of the Liponeuridae Loew (Blepharoceridae Loew, *olim*) Berl. Ent. Zeitsch. 1895, Bd. xl, pp. 148-169.

*Osten Sacken C. R. loc. cit

branched) second longitudinal vein, and eyes separated by a broad front. Within the genus, the new form agrees with *bilobata* Löw and *yosemite* O. S. in possessing a cross vein between veins 4 and 5, and finally resembles *bilobata* in having the sub-marginal cell sessile. But it differs from *bilobata* (as from all other Blepharoceridae) in having the radial sector springing from two roots (the base of the second longitudinal vein forked) so that a small triangular cell is formed behind R_1 (first longitudinal vein).

The only other Blepharoceridae so far known from the Pacific Coast are *Blepharocera ancilla* O. S. (California) and *Liponeura yosemite* O. S. (Yosemite Canon, California), from both of which the new species differs sharply in the character of the eyes and venation.

Unfortunately I have not been able yet to find the immature stages of the new species, so can add nothing to our incomplete knowledge of the interesting life-history of the members of the family.

One of the moot points regarding the biology of the Blepharoceridae is that of the dimorphism of the female. I have elsewhere * referred to Fritz Müller's statement that there are two kinds of females of *Paltostoma torrentium* (Brazil), one kind possessing mandibles and being blood-sucking, the other kind having no mandibles and being nectar-sucking. Osten Sacken deems the evidence of dimorphism insufficient. Of twenty-three females of *Blepharocera capitata* Löw taken by me at Ithaca, N. Y., no one was without mandibles, nor was there any other difference apparent. Most of these specimens were taken just as they were issuing from the pupal skins on various days, in various parts of the stream, so the criticism that one kind of female might possess habits rendering it more likely to be caught than the other, will not hold in this instance. It seems to me probable that there is no dimorphism of the females of *Blepharocera capitata* Löw. In the case of the new Californian species I can only say that both females (the only ones so far taken) agree in possessing mandibles, and in all other characters.

PROCEEDINGS OF THE CLUB.

12 JANUARY, 1900. The 211th regular and 23d annual meeting (since incorporation) was held at 156 Brattle St., Mr. W. L. W. Field in the chair.

Reports from the several officers were received and the following officers elected for the ensuing year: — President, J. W. Folsom; secretary, Roland Hayward; treasurer, Samuel Henshaw; librarian, Samuel H. Scudder; members at large of the executive committee, A. S. Hewins and A. P. Morse.

The address of the retiring president, A. G. Mayer, on the mating instinct in moths was next read. (See Psyche for February.) Much discussion followed, in which all present participated.

Mr. W. L. W. Field spoke of a cocoon of *Samia cynthia* which he had seen containing two pupae. In outward appearance, however, it showed no apparent difference from a normal cocoon of that species.

*Kellogg, loc. cit.

A NEW TETTIGIAN GENUS AND SPECIES FROM SOUTH AMERICA.

BY J. L. HANCOCK, CHICAGO, ILL.

The curious Tettigian here described from South America undoubtedly belongs to the subfamily Batrachidinae or Section VI of Professor Bolivar. From the group of which Tettigidea Scudder, and Paxilla Bolivar, form a part it is distinguished by the absence on the vertex of the frontal carina; the latter structure is represented, however, as a rudiment in the form of very small abbreviated lateral elevated ridges a little anterior to the supra ocular lobes of the head. It is the peculiar shortening of the last article of the posterior tarsus coincident with a lengthening of the first article which is specially characteristic in this new genus. These differences will necessitate a slight modification of existing tables of genera to receive it.

PAUROTARSUS gen. nov.

Body moderately long, slender, rugose. Face distinctly rounded anteriorly, slightly declined below. Vertex wide, considerably broader than one of the eyes; with a very small supra ocular lobe, on each side, separated behind from the broadened occiput by a little oblique fissure, front incompletely carinated; on each side close to the anterior inner border of the eyes, is a minute abbreviated, slightly converging carina, the space between these little latero-frontal carinae of the vertex obtusely sloping off in front; mid-carina abbreviated and very thin, slightly protuberant above, fusing with the smooth frontal costa.

In profile the head presents a distinctly rounded protuberant outline; as seen in front the frontal costa is strongly furcate, the branches widely and evenly diverging in their descension to the median ocellus. Eyes of moderate size, compresso-subtriangular in outline; ocelli distinctly showing in front of and a little above the middle of the eyes. Antennae (incomplete) slender, filiform, inserted in front of the eyes between the superior ocelli and the anterior inferior border of the eyes; apical article of maxillary palpi strongly ampliato-compressed. Pronotum scarcely convexed between the shoulders, anteriorly truncate, posteriorly long subulate, the pronotal process extending beyond the posterior femora; posterior border of lateral lobes feebly sinuate, the subhumeral sinus for the insertion of the elytra shallow. Elytra narrow; wings completely developed, extending beyond the process. Anterior femora slender, sulcate above; middle femoral carinae straight; external pagina of posterior femora rather rugose, the third article of the posterior tarsus very small, being less than one half the length of the first article, pulvilli subequal in length, straight below.

Paurotarsus amazonus sp. nov. Fig. 1a, 1b, 1c, 1d, 1e.

Body rugose, fuscous, first and second femora clouded with fuscous, tibiae annulated with fuscous. Vertex slightly tumid, nearly twice the breadth of one of the eyes, on each side provided with a small supra ocular lobe, divided behind from the broadened occiput by a minute oblique fissure, and just anterior to the supra ocular lobes are little abbreviated, slightly converging latero-frontal carinae which are separated anteriorly, apart about the width of one of the eyes, here the front is obtusely sloped off and not transversely carinated, mid-carina abbreviated, a little produced above, coalescing anteriorly with the frontal costa; frontal costa strongly compresso-protuberant, advanced in front of the eyes about three fourths the length of one of them, presenting with the vertex a distinctly rounded outline in profile; viewed in front the frontal costa is quite widely furcate, starting opposite the upper margin of the eyes, the branches are evenly divergent and straight in their descension to the median ocellus. Eyes compresso-subtriangular in outline, the posterior ocelli are conspicuous midway between the anterior margins of the frontal knee of hind femora; lateral lobes of the pronotum very little diverging below, the inferior margin scarcely reflected, the posterior margin feebly sinuate, the posterior inferior angle nearly straight, superior or subhumeral sinus for the insertion of the elytra shallow. Elytra slender, apically obtusely rounded, externally punctate; wings fully developed extending beyond the pronotal process. Anterior femora sulcate above; middle femoral carinae straight, posterior femora quite slender, the tibia multispinose, first article of posterior tarsus

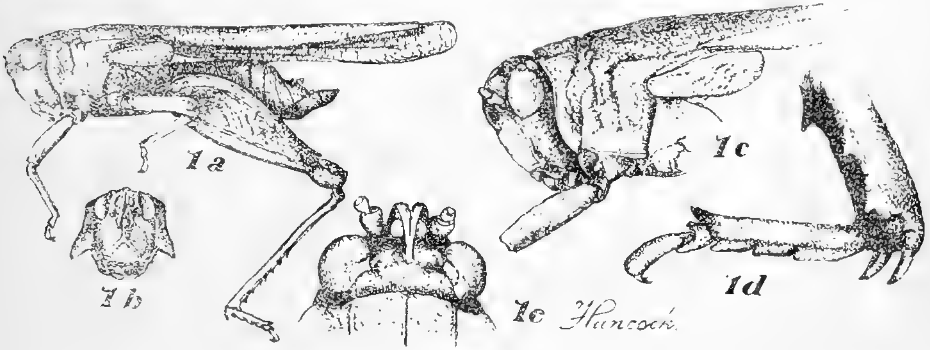

Fig. 1a, Paurotarsus amazonus sp. n. 1b, same, front view of face and pronotum. 1c, same, profile of body, greatly enlarged. 1d, same, tarsus of posterior leg, enlarged. 1e, same, dorsal view of head, enlarged. Original, from nature by Dr. Hancock.

costa and the eyes, on a plane a little above their middle. Antennae filiform, maxillary palpi apically ampliato-compressed. Pronotum with the dorsal front margin truncate, posteriorly long and subulate, between the shoulders transversely scarcely convexed, strongly rugose; median carina distinctly elevated, nearly straight, interrupted near the front margin by a transverse suture, anterior lateral carinae short, subparallel; humeral angles strongly obtuse, apical process of pronotum extending beyond the a little more than twice as long as the third, the pulvilli subequally long, straight below. The subgenital plate of male as viewed from above acute conical, bifurcated at the extremity.

Length Body, ♂, pronotum 13.5 mm. post. fem. 7.5 mm. Entire length of body to apex of wings 16.5 millimeters.

Locality, Manaos, Amazon, South America. O. Staudinger.

Labelled *Hedotettix*.

TABLE OF NORTH AMERICAN KERMES, BASED ON EXTERNAL CHARACTERS.

BY T. D. A. COCKERELL, MESILLA PARK, N. MEX.

Not entirely covered with wax, nor pubescent, nor covered with a white powder 1

Covered all over with dull white wax. (Arizona) . *ceriferus* Ehrhorn.

Covered with snow-white powder, except on the middle of the back. (Mass.) . . . . *nivalis* King & Ckll.

Small, thinly pubescent. (Kans., Mass.) . . . . *pubescens* Bogue.

1. Convex, without a median longitudinal constriction 2
   With a more or less distinct median longitudinal constriction . . . 6
2. Large, with transverse sulci, the segments more or less gibbous, with three gibbosities (one median) in each transverse series. (Colo., N. M.) *gillettei* Ckll.
   Segments not at all gibbous 3
3. Very large (10 mm. diam.), rather rough, marbled with brown and dull white, the white with brown specks. (Mexico.) . . . *grandis* Ckll.
   Not so large, species of the U. S. 4
4. Extremely convex, red brown with distinct dark ferruginous transverse bands. (Mass.) . . . . *andrei* King.
   Orange-brown, marbled with dull white, the white with fulvous points; younger individuals with a broken waxy coating. (Calif.) *austini* Ehrh.
   Larger than *austini*, nearly globular, marbled with white, black and reddish, or black and reddish, covered with waxy secretion, which is divided into small portions separated by smooth (wax-free) lines; the minute points on the white are intensely black. (Okla.) . . . . . *boguei* Ckll.
   Pale ochreous, or reddish, with small black spots, and minute black points, usually distinctly variegated with irregular pale bands . . . 5
5. Broader than long, the pale bands running in a transverse direction, parallel with the rows of black spots. (Bluffton, S. C., etc.) *galliformis* Riley.
   Longer than broad, the pale bands running longitudinally, at right angles to the rows of spots. (Mass., Del.) . . . . . *kingii* Ckll.
6. Segmentation distinct, segments very strongly gibbous. (Calif.) *cockerelli* Ehrh.
   Segmentation distinct, but segments not gibbous; surface not speckled with black. (Kansas.) . . . . *concinnulus* Ckll.
   Segmentation not distinct, nor the segments gibbous; surface speckled with black or dark dots 7

7. Black spots conspicuous, arranged in transverse rows; black specks not always conspicuous. (N. Y., Mass.; also collected by Fletcher in Canada, on *Quercus rubra.*) . . . . *pettiti* Ehrh.
Black spots minute, not definitely arranged in transverse rows; black specks very distinct; ground color pale ochreous. (Calif., Mexico.)
nigropunctatus Ehrh. & Ckll.

I have taken as typical of *galliformis* a specimen from the Riley collection. collected by J. H. Mellichamp at Bluffton, S. C. Riley's description shows that he also included *K. pettiti* under the same name. Mr. G. B. King has collected *pettiti* in Massachusetts

THE SPECIES OF THE OEDIPODINE GENUS HELIASTUS SAUSS., OCCURRING IN THE UNITED STATES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Heliastus was founded by Saussure in 1884 on some Mexican and Central American Oedipodinae. It was first recognized as occurring in the United States three years ago, when I referred to it two insects which had been described as species of Thrincus. Both of these species also occur in Mexico, but were unknown to Saussure. I can now add another and undescribed species, known to me from only a single locality in California, and collected by Mr. A. P. Morse. All these northern species belong to Saussure's second division of the group in which the lower posterior angle of the lateral lobes is not produced into a distinct process. They are all of a light gray color, more or less irregularly spotted with brown, sometimes forming brief transverse markings when the insect is alighted; the wings are glazed, often iridescent, and generally, at least in part, weakly tinted. The males are considerably smaller than the females. The species may be separated as follows: —

Table of our species of Heliastus.

a^1. Of large size. Antennae at least two thirds as long as hind femora; posterior process of metazona weakly obtusangulate, often almost rectangulate; descending lobes of pronotum apically well rounded, falling distinctly below the level of the pleural lobe anterior to them.

b^1. Larger. Descending lobes of pronotum angulato-rotundate below; wings hyalino-citron basally, weakly infuscated apically . . *aridus.*

b^2. Smaller. Descending lobes of pronotum regularly rotundate below; wings pellucid, or faintly violaceous, only the veins fuscous.
californicus.

a^2. Of small size. Antennae only half as long as hind femora; posterior process of metazona strongly obtusangulated, or broadly rounded; descending lobes of pronotum apically truncate, not falling below the level of the free pleural lobe anterior to them.

minimus.

Heliastus aridus.

Thrincus aridus Brun., Proc. U. S. nat. mus., xii, 78-79. pl. 1, fig. 2, 3 (aridus on plate; avidus in text) (1890); Ril., N. A. fauna, vii, 252 (1893); Towns., Ins. life, vi, 31 (1893).

Heliastus aridus Scudd., Can. ent., xxix, 75 (1897); Catal. Orth. U. S. 44 (1900).

Originally described from Albuquerque, N. Mex. (Bruner), it has since been recorded from Las Cruces, N. Mex. (Townsend), and Panamint Valley, Cal. (Riley). I have received it from Las Cruces (Townsend) and Mesilla, N. Mex., July 1 (Morse), as well as from Juarez, Mex., July 3 (Morse). Mr. Morse tells me that it is a common insect at Mesilla, found on sand hills and the gravelly mesa, where it is almost invisible, the color and markings varying with the locality; it flies freely, but not far.

Heliastus californicus.

Thrincus californicus Thom., Bull. U. S. geol. surv. terr., i, no. 2, ser. i, 66 (1874); Glov. Ill. N. A ent., Orth., pl. 17, fig. 6, 7 (1874); Coq., Ins. life, i, 228 (1889); Brun., Proc. U. S. nat. mus. xii, 187 (1890).

Heliastus californicus Scudd., Can. ent. xxxix, 75 (1897); Cat. Orth. U. S., 44 (1900).

This species was described by Thomas from specimens taken by Crotch in Southern California, and has since been mentioned as found at Los Angeles, Cal. (Coquillett), and in the Cerros Isl. off the coast of Lower California (Bruner). I have seen specimens from San Diego (Crotch), Indio, July 9 (Morse), Palm Springs, July 9 (Morse), Mohave, Cal., Aug. 1 (Morse), and Rock Spring in southeastern California (Palmer), as well as from some other unspecified point in California, collected by Osten Sacken,* who reports it as found "among boulders of granite, the colors of which it seems to mimic." I have it also from St. George, Utah, Apr. 1–12 (Palmer), from Saltillo, Mex., Mar. 21–28 (Palmer), and Sonora (Schott), as well as from Cape St. Lucas, Lower California (Xantus).

Heliastus minimus sp. nov.

Of small size, cinereo-testaceous, more or less embrowned above on head and pronotum, marked with brownish fuscous, the face, genae, lower portion of lateral lobes and sometimes their whole metazonal portion overlaid with chalky white. Head prominent, the sculpturing much as in *H. californicus* but the face retreating more; eyes rather prominent, especially in male; antennae short, about half as long as the hind femora, in no way attenuate or depressed at apex, fusco-testaceous; feebly in-

* Baron Osten Sacken collected Orthoptera in Sonoma and Marin Cos. north of San Francisco, but this insect has not otherwise been reported from so northern a locality, or farther north than Mohave.

fuscated apically, not banded. Pronotum marked with brownish fuscous on the prozona behind the eyes and sometimes across the posterior margin of the prozonal disk, the front margin of which is a little elevated especially above and in the male, the disk of whole prozona tolerably smooth and nearly plane, the median carina very slight, the hind margin strongly obtusangulate or broadly rounded, the lateral lobes inferiorly truncate not extending below the level of the free pleural lobe. Tegmina rather slender, subequal, pale testaceous, feebly embrowned mesially in proximal half, flecked conspicuously with well distributed brownish fuscous spots; wings glistening hyaline, a few of the veins at extreme apex narrowly and inconspicuously infuscated, at least in the female. Hind femora long and slender, pale testaceous, occasionally and especially at base hoary, bifasciate above with brownish fuscous.

Length of body, ♂, 10.25 mm., ♀, 18 mm.; antennae, ♂, 3.5 mm., ♀, 5 mm.; tegmina, ♂, 9.5 mm., ♀, 16.5 mm.; hind femora, ♂, 7 mm., ♀, 11 mm. One male is of unusual size, the tegmina measuring 14 mm. in length, but otherwise there is little variation in the specimens from the above figures.

13 ♂ 13 ♀. Palm Springs, Cal., July 9, 12, A. P. Morse.

The species is peculiar for its small size, short antennae, slender hind femora, brief lateral lobes and broadly angulate metazonal process.

INSECT-NEURATION.

The work of Comstock and Needham* upon the wings of insects is decidedly an important contribution to the subject, for a firm step has been taken towards a satisfactory theory of venation. This advance has been attained by an extended study of the tracheae which precede and, in a broad way, determine the positions of the veins. Selecting immature stages of generalized representatives of each order, the authors arrive at a type of tracheation which may fairly be taken to represent a primitive condition,—an origin for more complicated types of tracheation and venation. The lines along which specialization appears to have occurred in the larger orders are carefully traced and the processes fully and clearly figured. Specialization occurs either by the reduction (atrophy or coalescence) or else by the addition of veins from a multiplication of the branches of the principal veins. Fortunately the familiar terms adopted by Redtenbacher are retained.

Committing ourselves to the authors' conclusions, perhaps too unreservedly, we were mildly shocked to find that the method fails of application among Trichoptera, most Diptera and the Hymenoptera, at least, because the correlation between tracheae and veins is almost lost. As the method seems to have justified itself, however, a critic can scarcely do more at present than to emphasize the necessity of caution in the employment of the method.

Especially instructive are the discussions upon the wings of Odonata, Ephemerida and Orthoptera. The elytra of Coleoptera are definitely homologized with wings.

The palaeontological evidence is rather summarily dismissed with the negative conclusion that it does not contradict the authors' results. Precisely on account of the "imperfection of the record" does the close resemblance of the Devonian Xenoneura to the hypothetical type of the authors acquire a value that makes the above conclusion unnecessarily cautious.

*Comstock, J. H. and Needham, J. G. The Wings of Insects. A series of articles on the structure and development of the wings of insects, with special reference to the taxonomic value of the characters presented by the wings. 124 pp., 90 figs. Reprinted from The American Naturalist. Ithaca, N. Y. The Comstock Publishing Co.

Now that the study of wing development promises to dispel the uncertainty which has characterized our theories of venation, the palaeontological evidence will gather new interest in proportion as the data from recent insects become more definite. In fact, no theory of venation can escape the criticism of incompleteness which does no have sufficient regard for the evidence derived from fossil forms.

The substantial progress which Comstock and Needham have inaugurated ought to stimulate many others to continue the same line of study.

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

ON THE SPECIES OF NEMOBIUS KNOWN TO OCCUR IN INDIANA.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

Among the Gryllidae occurring in the Northern-Central States the members of the genus Nemobius rank first in number of individuals. From August first to mid-November they swarm by thousands on every grass plot and piece of waste ground, whether in open sunny fields or the dense shade of the forest. Even the tangled masses of sphagnum mosses and other semi-aquatic growth of fen and marsh furnish shelter and food to certain species which, in the ages of the past, have become adapted to a life of such surroundings.

But while the individuals are so plentiful, their size is so small that heretofore they have received but little attention from the average collector. Moreover, so similar in general appearance are they that very close observation by the student is necessary to separate the species one from another. As a consequence but 18 have hitherto been described from the whole of North America, while but three have been accredited to the States north of Florida and east of the Rocky Mountains. McNeill* listed but one from Illinois, and I, in a former paper, but three (one of which is but a short winged form) from Indiana.* Bruner † mentions three, two without names, from Kansas, while Scudder, in the most recent paper on the group ‡ accredits three, viz: *N. fasciatus*, *N. cubensis* and *N. carolinus* to the Central and Eastern States.

* Psyche, VI, 1891, 6.

Within the past five years many specimens have been collected in different parts of Indiana. A careful study of these reveals the presence of at least six species and one well marked variety, three of which are herewith described for the first time. There is little doubt but that the right kind of investigation will show the presence of as many or more in almost any State east of the Rocky Mountains. Those known to occur in Indiana are as follows:

1. N. fasciatus De Geer.

This, the long-winged form of our most common species, has been taken by me only in the vicinity of electric lights. The wings of both sexes extend much beyond the tips of hind femora, those of the ♀ reaching to or beyond the tip of ovipositor, while the tegmina

* "The Gryllidae of Indiana," in Proc. Ind. Acad. Sci., 1891, pp. 134-136.

† Publ. Neb. Acad. Sci., III, 1893, 32.

‡ Journ. N. Y. Ent. Soc., IV, 1896, pp. 99-107.

reach to the end of the abdomen. During hundreds of days spent in field collecting not a single specimen of *fasciatus* has been seen. Many, however, have been taken from the walks and streets of Indianapolis, Fort Wayne and other cities and towns in the northern part of the State, but none, as yet, in the southern half, not even in Terre Haute, where I resided for seven years. Where the insect breeds, and feeds by day is to me unknown. At times, as in the first week of August, 1899, swarms composed of myriads have appeared about the lights of some of the cities. The newspapers the next day had a column or more devoted to the insects but nothing, except wild guesses, as to whence they came.

1a. **N. fasciatus vittatus** Harris.

This is the form which abounds everywhere throughout the State. It varies in color from a dusky brown to a rusty black. When of the latter hue the stripes on the head, to which it owes its varietal name, are very dim or wholly invisible. In size it is larger than any other, except the long-winged *fasciatus*. The largest specimens in my collection have come from the borders of swamps. The tegmina of the ♀ cover a little more than half the abdomen and their cross veinlets are coarser and much more prominent than in the next species. Those of the ♂ cover three-fourths of the abdomen. The ovipositor is about one eighth longer than the hind femora.

No intermediate short winged forms connecting *fasciatus* with *vittatus* have been seen by me, nor have any been recorded to my knowledge. The two are, however, regarded as dimorphic forms of the same species by the leading authorities, Saussure and Scudder. In Indiana *vittatus* begins to reach maturity about July 20. Living specimens have been seen as late as December 1st. Although present in vast numbers, but little is known of its life habits. It appears to be omnivorous, feeding upon carrion, cow dung and grasses with equal avidity. Though small in size the aggregate damage which it causes to grass and kindred plants in the course of a single season must be great, and there is little doubt but that it, as well as the other species of the genus, should be classed among those insects highly destructive to forage plants.*

2. **N. maculatus** sp. nov.

Size medium; head rather prominent, dark luteous or castaneous, more or less dotted with piceous, especially on forehead and cheeks; eyes rather large, prominent. Antennae dull luteous, the basal third lighter; maxillary palpi luteous, the apical half of terminal joint piceous. Pronotum broader than long, faintly tapering anteriorly; the dorsal field castaneous with numerous dark points; the front margin and lateral field sparingly beset with stiff black bristles. A piceous stripe starts back of the eye and covers the upper two-thirds of lateral field of both pronotum and tegmina. The latter with a yellowish vein separating the dorsal and lat-

* For other accounts of the destruction wrought by the species of Nemobius see Rathvon, U. S. Agr. Report, 1862, p. 380, and Osborne, Bull. 23, U. S. Div. Ent. p. 59.

eral fields, more prominent in the ♂. The dorsal field testaceous, sometimes with piceous dots; in ♀ covering one-third of abdomen, in ♂ two thirds; wings absent. Legs and dorsal surface of abdomen testaceous sprinkled with fuscous which on dorsal surface of hind femora is sometimes in cross-bars. Ovipositor almost straight, equalling in length or very slightly shorter than hind femora; the apical blades rather long, tapering evenly to a fine point; above, evenly and sharply serrulate. Length of body 8 mm.; of hind femora, 6.5 mm.; of ovipositor, 6.5 mm.; of promotum, 2.5 mm.; of tegmina, ♀ 2.8 mm., ♂ 4 mm. Width of pronotum, 3 mm. 1 ♂, 9 ♀'s.

N. maculatus is readily distinguished from *N. fasciatus vittatus*, by its average smaller size, shorter and straighter ovipositor, fewer hairs on head and pronotum and finer cross veinlets of ♀ tegmina. The serrulations of the ovipositor are sharper than in *vittatus*. The two also differ in color, the ground of *maculatus* being lighter and the piceous more generally sprinkled where in *vittatus* it is in lengthwise bars. *Maculatus* has been taken in small numbers only in Marion and Vigo counties. It is found in low open woods, usually in the vicinity of or beneath logs.

3. **N. palustris** sp. nov.

Size small; the body of ♂ especially short and broad. Head tumid; eyes large, but not prominent. Pronotum one third broader than long, the sides subequal, rather thickly beset with stiff black bristles, as is also the forehead and dorsal surface of the two front femora. Head, tegmina and body of most specimens, a uniform dark piceous; disk of pronotum piceous or fuscous sprinkled with piceous. Antennae, legs and ovipositor fuscous. Maxillary palpi luteous except the apical joint which is wholly piceous. Tegmina of ♀ covering a little more than half the abdomen; those of ♂ hardly reaching its tip. Ovipositor almost a third shorter than hind femora, distinctly though feebly arcuate, the apical blades but little enlarged at the base, very finely serrulate with dull rasp-like teeth. Length of body of ♀, 6.5 mm.; of hind femora, 5 mm.; of ovipositor, 3.5 mm.

This handsome, little pitch brown Nemobiid has been found only among the tamarack swamps and cranberry bogs of the northern part of the State, where it finds a congenial home in the midst of the dense, damp sphagnum mosses. Sometimes they are so plentiful that a half dozen or more are seen in an area a foot square. Like the other members of the genus they are very active, when disturbed leaping vigorously, a few inches at a time, and finally seeking safety by burrowing in the masses of moss.

4. **N. carolinus** Scudder.

This prettily marked little species has been found to be rather common on the grass covered banks of streams and along the fence rows of open woods in Vigo, Putnam and Monroe counties. In general appearance it is a diminutive form of *N. maculatus* above described, but its small size and short arcuate ovipositor at once distinguish it. According to Scudder, *carolinus* ranges from New England to Nebraska and Texas.

5. **N. exiguus** sp. nov.

Size medium; body slender; head rather

large, but slightly tumid. Eyes small but prominent. Antennae, head, pronotum and femora testaceous. Maxillary palpi light yellow throughout or with the apical third of terminal joint infuscated. Tegmina of ♂ reaching tip of abdomen, testaceous with a narrow piceous bar on upper third of lateral field and with basal third of dorsal field usually more or less piceous. Tegmina of ♀ covering one half or more of abdomen, the dorsal field usually heavily shaded with piceous; wings absent in both sexes. Upper surface of abdomen piceous, lower surface testaceous or luteous. Ovipositor a third or more shorter than hind femora, distinctly arcuate, the apical blade not enlarged at the base, armed above with very small and rather dull teeth which are irregularly distant one from another. Length of body, 7.5 mm.; of hind femora, 6.3 mm.; of ovipositor, 3.5 mm.; of tegmina, ♂, 5 mm., ♀, 4 mm.

This is the "*N. exiguus* Scudder" of my paper on the "Gryllidae of Indiana" *loc. cit.* It appears, however, that Scudder had not described a species as *exiguus* but had merely mentioned a form of *N. fasciatus* under the name. Beutenmuller afterward* described *N. affinis* from New York, which he stated was the insect mentioned by me, but which, according to Scudder,† is *N. carolinus*.

* Bull. Am. Mus. Nat. Hist., VI, 1894, p. 250.

† *Loc. cit.* p. 107.

Exiguus is longer and proportionately more slender than *carolinus*, though the tegmina of the male are broader. The pronotum and femora are not mottled or marked with fuscous as in that species. The serrations of ovipositor of *carolinus* are smaller, sharper and more evenly separated than in *exiguus*. The latter species occurs in all parts of the State and is fully one-half as common as *N. fasciatus vittatus*. Its habits, time of appearance and local habitat are also essentially the same. However, the smaller size, short ovipositor, yellowish maxillary palpi, and other differences in color, readily distinguish it from *vittatus*.

6. **N. cubensis?** Saussure.

Two ♂'s, distinct from those of any of the above species, were taken October 9th, 1893, from the sandy bed of the old canal north of Terre Haute, Indiana. They were sent to Mr. Scudder who reports them probably the short-winged form of *N. cubensis*. In life they were shining black with a bright yellow line separating the dorsal and lateral fields of the tegmina. No corresponding females have as yet been secured from Indiana, but Scudder records two as having been taken in Illinois.

ON SOME AMERICAN SPECIES OF MACROPSIS (JASSIDAE).

BY C. F. BAKER, ST. LOUIS, MO.

In America, Macropsis is distinctly southern in distribution. In Van Duzee's List of Jassina four species are credited to North America, two to Mexico, and two to Colorado and the southwest. Three have been described from South America by Stål and one by Lethierry. In this paper three are added to the South American list and six to the United States. As at present known, one species occurs throughout the southern United States, one in Alabama, one in the Argus Mts., Cal., one in the Magdalena Mts., N. M., two in southern California, two in Colorado, two in Mexico and four in South America, Undoubtedly a number more will be found in Central and South America.

Pachyopsis Uhl., is strictly synonymous with Macropsis Lewis.

Macropsis idioceroides n. sp. — Male. Length 5.5 mm. Strongly resembling an Idiocerus in form. Head very little if any narrower than pronotum, vertex scarcely longer at middle than at eyes. Front very minutely rugose below. Ledges over antennal cavities short. Clypeus strongly convex, very broad at base, suddenly strongly narrowed beyond the middle to the rounded apex. On a space along the anterior margin of pronotum, the usual aciculation gives place to a fine shagreening. Lateral pronotal carinae not reaching eyes but curved far down on to the pleurae. Punctures on clavus fairly numerous and setigerous; punctures on corium obsoletely if at all setigerous, sparse, and arranged in longitudinal rows.

Color pale olivaceous, head and below yellowish, the legs greenish. Eyes dull carmine. Elytra transparent.

Valve transverse, longer than preceding segment, hind margin straight. Plates strongly convex, twice longer than width of both, bulging laterally below, then narrowed to an acute point.

Described from one example collected in the Magdalena Mts., N. M., in August (Snow). This is one of the most interesting Bythoscopids occurring in North America. Though so closely resembling an Idiocerus, it yet presents all the characters of Macropsis. The width of head, form of clypeus, and the position of the lateral pronotal carinae, separate it widely from all other species of the genus.

Macropsis lactus (Uhl.) — I have collected this species at Fort Collins, Colo., in September. It somewhat resembles the European *prasinus* in coloration and size, but is nearer *lanio* in structure. The head is broader than in *prasinus*, and the elytra possess supernumerary veins at apex. It differs from *lanio* in various structural characters, and more conspicuously, in lacking the fuscous irrorations on head and pronotum. *Laetus* is the only American representative of the group including *prasinus* and *lanio*, and in which the elytra are elongate and the punctures not setigerous. The other American species are more like *microcephala*.

Macropsis atra n. sp.—Male. Length 4 mm. Form of *robustus*. Head somewhat narrower than pronotum, vertex very slightly longer at middle than at eyes. Front unusually distinctly transversely aciculate throughout. Ledges over antennal cavities nearly in a straight line. Clypeus a half longer than broad, with sides parallel, apex subtruncate. Pronotum aciculate throughout. Elytra sordid whitish opaque; hairs strong, numerous, and black, except on base of clavus where they are white and weak.

Beneath, with lower part of face including margins of front, very pale sordid yellowish. Upper part of face with most of front, vertex; pronotum and scutel (except the piceous apex), black. Narrow margin along inner angle of clavus ferruginous. Fore and middle legs slightly embrowned, hind legs greenish.

Last ventral segment nearly square, twice the length of preceding segment, hind margin nearly truncate.

Described from a single specimen in the National Museum collection, taken in the Argus Mts., Cal., in May, by Mr. Koebele. It closely resembles *humilis* Stål, and may prove but a variety of it. The extent of black is not so great in *atra*. *Atra* resembles some of the Mexican and South American species more nearly than any other species we have.

Macropsis smithii n. sp.—Female. Length 4 mm. Very stout. Head considerably narrower than pronotum; vertex short; as long at middle as at eyes. Front becoming nearly smooth below. Ledges over antennal cavities strongly bent towards clypeus. Clypeus distinctly, but little, longer than broad with sides slightly converging apically to the broadly rounded apex. Aciculation on pronotum becoming obsolete medially on anterior submargin. Elytra hyaline, hairs strong, black fairly numerous, weak and white on base of clavus.

Pale straw color, legs greenish. More or less of pronotum along hind margin, basal portion of clavus, and sometimes narrow basal margin of scutel, black or piceous.

Last ventral segment twice length of preceding; hind margin broadly rounded, on either side of the middle with a narrow slit extending to one-third the length of the segment, and enclosing a rectangular tooth.

Male like the female. Last ventral segment greatly enlarged, broader and three times the length of the preceding segment; subquadrangular, medially longitudinally creased, the outer margins broadly rounded; hind margin with a large subrectangular tooth, rounded at tip, margins broadly depressed, and bent backwards into the fissure of the pygofers.

Described from seven females and one male in the Herbert H. Smith collection, taken at Chapada, Brazil. This species strongly resembles *pallescens* but it lacks the dark markings on vertex, and presents a totally different form of genitals.

Macropsis pallescens (Stål.)—1862 Stål, K. Vet. Akad. Handl. B. 3, No. 6, p. 49 (*Stragania pallescens*).

There is a single typical example of this species in the Herbert H. Smith collection, from Chapada, Brazil, collected in November. The last ventral segment is broadly rounded apically and has a good sized rectangular median notch.

Macropsis sordidus n. sp.—Female. Length 4.5 mm. The general form and vertex of *smithii.* Clypeus no longer than broad, sides very slightly converging to the subtruncate apex. Ledges over antennal cavities strongly bent towards clypeus. Pronotum aciculate except within anterior lateral angles, where there are some faint brownish spots. Elytra whitish opaque, very strongly but somewhat sparsely setigerous punctate, the hairs on base of clavus weak and white.

Color sordid yellowish, tinged with greenish on pronotum posteriorly, scutel, costa at base, and hind tibiae.

Last ventral segment twice the length of the preceding, hind margin broadly rounded, with a large median notch which is acute at apex and reaches nearly a third the length of the segment.

Described from a single female in the Herbert H. Smith collection, taken at Chapada, Brazil, in April. This may be near *divisa* Stål, which I have not seen, but it does not at all fit the description of that species.

Macropsis californicus n. sp. — Female. Length 5 mm. Far larger and stouter than *robustus.* Head little narrower than pronotum. Vertex very slightly longer on middle than next eye. Clypeus slightly longer than broad at base, sides gently converging towards the truncate apex. Ledges over antennal grooves nearly in a straight line. Pronotum aciculate except just within lateral carinae. Elytra thick, opaque, with a number of supernumerary veinlets towards the apex; hairs on elytra not strong anywhere, those on clavus weak and white, those on corium sparse and mostly black.

Head, all below, and elytra largely, pale straw color. Pronotum rufescent. A narrow area on clavus, adjoining inner angle usually deep reddish. Elytra often more or less tinged with reddish toward base. Dorsal segments mostly with discs black.

Last ventral segment little longer than preceding, broadly deeply emarginate, bottom of the emargination inclining to subrectangular.

Male. Length 4.75. Front above, vertex except narrow basal margin, pronotum and extreme base of scutel, black to piceous. Elytra except apical areoles suffused with bright reddish. Last ventral segment over twice the length of preceding segment, hind margin broadly rounded and with a minute median slit.

Described from one male and a number of females in the National Museum collection, taken by Mr. Koebele in Placer Co., Calif., during September and October. One female partakes somewhat of the male characters in having a spot on front above and anterior margin of pronotum, blackened. This is the most highly colored of known North American species.

Macropsis magnus n. sp. — Female. Length 5.5 mm Near to *californicus*, but differing from it as follows: Larger and stouter. Pronotum without distinct supernumerary veins. Whole insect darker throughout. Vertex on either side in front, and basal margin of scutel, piceous or black. The dark color on scutel shading through ferruginous to light yellow at apex. Wings dark fuliginous at base.

Last ventral segment of female twice the length of preceding, hind margin trisinuate, the three sinuosities of equal depth, the lateral broad, the median narrow and acute.

Described from a single female in the National Museum collection, taken in Los Angeles Co., Cal., by Mr. Coquillett. It is very near to *californicus* but easily separated by the size and genital characters.

Macropsis ornatula (Stål.) 1862 Stål, K. Vet. Akad. Handl. B. 3, No. 6, p. 49 (*Stragania ornatula*).

I have referred to this species six specimens in the Herbert H. Smith collection, taken at Chapada, Brazil, in May. These specimens fit the original description perfectly, except that they are only 3.5 mm. in length. The last ventral segment in the female is twice the length of the preceding, the hind margin very broadly slightly produced, between which and the lateral angles on either side, there is a slight concavity. In the male the last ventral segment is a half longer than preceding, the hind margin truncate.

Macropsis rufoscutellatus n. sp. — Female. Length 4.5 mm. Much stouter than *robustus*. Head somewhat narrower than pronotum, vertex somewhat longer at middle than at eye. Clypeus little longer than broad at base, the sides gently converging to the rounded tip. Ledges over antennal cavities distinctly bent towards the clypeus Pronotum aciculate throughout. Elytra subhyaline, hairs weak and white towards base of clavus, black on remainder of clavus and corium, fairly numerous except at apex of corium.

Light green throughout, scutel except apex, and adjoining border of clavus, rufous.

Last ventral segment deeply emarginate, the apex of the emargination with a short broadly triangular projection.

Male more sordid in coloration and with a greater extent of rufous on the clavus. Last ventral segment more than twice the length of preceding, hind margin strongly rounded.

Described from two females and one male collected by myself in the foothills west of Fort Collins, Colo., during May and June. In the Prelim. List Hemip., Colo., this species was confused with *robustus*, but it is distinct. I unfortunately made a partial distribution of it under the latter name. It is of frequent occurrence in Northern Colorado.

Macropsis robustus Uhl.— This is the most common species of the genus in the United States. It occurs throughout the Southern States from the Atlantic to the Pacific, and in the Rocky Mountain Region as far north as Northern Colorado. I have many specimens from Arizona, California, Louisiana and Alabama. Dr. Uhler also records it from New Mexico and Texas.

It is one of the smallest forms, clear green to pale straw color throughout. The clypeus is distinctly longer than broad. The hairs on the elytra are black throughout the clavus and corium. The last ventral segment of the female is shallowly bisinuate behind, the included projection small, acute and equalling the lateral angles.

Macropsis alabamensis n. sp. — Female. Length 4.5 mm. Closely resembling *robustus* from which it differs as follows: Clypeus scarcely as long as broad, the genae distinctly incurved to meet its tip. Hairs on elytra weak, white, and rather sparse throughout. The commissural margin from the scutel to the apex of elytra narrowly blackened. Appendix strongly infuscate, the three apical cells each with a brown spot at tip.

Last ventral segment bisinuate, the enclosed projection large, exceeding a little the lateral angles, and broadly rounded.

Described from three females, collected at Auburn, Ala., in September by myself. These three specimens are uniform in the above characters. I find no gradation towards them in my entire series of *robustus*, numbering some ninety specimens, some of which are from Alabama.

Macropsis stramineus n. sp.—Female. Length 4 mm. Near *alabamensis* than which it is stouter. It differs as follows: Bright straw color throughout. Hairs on elytra black, very short and very sparse, almost wanting on median portion. A brown cloud at tip of clavus and more or less numerous small brown marks at apex of corium. Last ventral segment as in *alabamensis*.

Described from three females in the Herbert H. Smith collection, taken at Chapada, Brazil, in October and November.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Gypsochroa haesitata Guen.

Egg. Elliptical, a little flattened above and below, one end larger than the other, but full and well rounded; micropylar (large) end not flattened. Smooth, finely shagreened, the reticulations obsolete, just the faintest trace perceptible in the shell. Not shining, ocher yellow. Size .6 × .55 × .5. mm. Laid singly on spider's webs or other delicate thread on the leaves or branches of its food plant.

Stage I. Head round, bilobed, clypeus moderate, rather flat before; very pale brown, a narrow dark line on posterior edge of cheeks; ocelli and mouth dark; not shining; width .4 mm. Body not very slender, cylindrical, smooth, normal, dull greenish, sordid dark and opaque, no definite lines, but numerous longitudinal fine paler streaks, somewhat confused. Feet pale; tubercles small, brown; setae black with slightly swollen tips; no subprimaries; tubercle iii superstigmatal anterior, iv post stigmatal, a trifle above the whitish tracheal line, v well anterior, vii with separated hairs: on thorax ia, iia, iv and vi visible.

Stage II. Head rounded, flattened before, held out flat, mouth projecting, antennae distinct; sordid brown, speckled with darker, a faint, grayish V-shaped shade bordering the clypeus; width .7 mm. Body not very slender; legless segments elongated. Green, the ends, joints 2 to 5 and 10 to 13 shaded with brown, anteriorly darkly shaded especially subdorsally, posteriorly lighter, faintly longitudinally lined, but without distinct bands. Feet pale; tubercles obsolete, setae fine short and pale. Shields concolorous and obscure.

Stage III. Head round, flattened before, not bilobed and free from joint 2; whitish, densely mottled with pale brown, more sparsely about the clypeus; ocelli black; width 1.2 mm. Body moderate, cylindrical, uniform, translucent whitish green, green from the food, with irregular longitudinal rows of small white specks; at the extremities faintly tinged with brown and the specks become dark. Tracheal line visible; spiracles narrowly black rimmed; tubercles small, white; setae very short, pale.

Stage IV. Head rounded, very slightly bilobed, whitish green, thickly mottled with spots of dull olive green; antennae rather long, last joint salmon color; width 2 mm. Body cylindrical, normal, anal plate large, slightly pointed; no cervical shield, all concolorous. Green, mottled with irregular longitudinal lines and spots of more opaque yellowish green and a few brown dots and specks; tubercles white, small. Spiracles white, narrowly black rimmed. A group of dorsal black specks between tubercles i and ii on the dorsal line on joints 4 to 10, heaviest on 9 and 10, black spots on subventral fold posteriorly, heaviest on 9 and 10. Feet green, brown speckled. Setae short, pale. Beneath as above, all uniformly colored without distinct lines. Next day after moulting turned all dark brown, head and all alike, resembling bark, mottled with greenish brown and black crinkled lines; tubercles white, the black patches showing as darker shades.

Entered ground to pupate. Imago in twelve days. Food plant *Pisonia aculeata* L., only the young leaves, the old leaves being as inedible to the larvae, especially when young, as leaves of any other plant. Larvae from Palm Beach and Key West, Florida.

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THE MELANOPLI OF KANSAS.—I.

BY S. J. HUNTER AND W. S. SUTTON, KANSAS UNIVERSITY, LAWRENCE.

The discussions which follow refer to species taken in the State during the field work of the past two seasons. It has not been the endeavŏr to ascertain, at this time, the number of species existing within the State. The study has been conducted more especially with reference to the subject of variation. Later it is probable that the work may take the form of a survey of the group. The greater part of the material studied has been taken along the Arkansas river south of Offerlie in Ford county by Hunter, in Hamilton county three miles east of Syracuse by Hunter, and in Russell county about three miles northwest of Russell, by Sutton. The order followed in this group is that of Scudder in his Revision of the Melanopli.*

HESPEROTETTIX.

H. pratensis Scudder.—Tegmina of four of the six specimens exceed the abdomen in length. In two of these cases one male and one female by 3.5 and 3 mm. respectively. Scudder says "tegmina about length of abdomen in both sexes." In his key, however, he says tegmina distinctly surpass the abdomen (in the male) or equal it (in the female) Male cerci straight, not "feebly down-curved."

Quite rare, taken only in buffalo grass pastures. A species much sought after by both parties while collecting, and taken, as the field notes show, only on cloudy days after rain. At these times it was very active. Is it possible that its alertness under favorable conditions, warmth and sunshine, keep it beyond the range of the collector? Only three females and two males (Ford county) and one male (Russell county) were taken. The beautiful white dashes upon the lateral aspect of the thorax fade out entirely in the dried specimens. As far as our knowledge extends, now first reported from Kansas.

H. speciosus Scudder.—All specimens have median carina of pronotum "pink roseate," some conspicuously so. Humeral angle of hind margin of metazona hardly apparent. In the three males before us the subapical tubercles are transverse, and one distinctly though not deeply bifid. Scudder says this bifurcation occasionally happens in drying. In this case shrivelling is not apparent; it appears to be a natural structure. Lower half of labrum and space between vertical carinae of upper half, piceous. Coloration here not given by Scudder. Several nymphs of

* Rev. Orthopt. group Melanopli (Acridiidae) with special ref. to N. A. forms. Proc. U. S. Nat. Mus. Vol. XX. pp. 1–421, Pl. i–xxvi.

the last ecdysis were taken. These closely resembled the adult in form and ground color, but differed in having no red or roseate markings whatever. Labrum marked as in adult, but antennae green instead of pink; and each segment margined with piceous.

This species feeds largely upon lamb's-quarter, *Chenopodium album*, and furnishes an interesting example of protective coloration, in that green and roseate markings of plant and insect are almost identical. The insect, therefore, is not readily perceived at rest upon this weed.

Two males, three females (Ford county) one male, two females (Hamilton county) one female (Russell county).

AEOLOPLUS.

A. regalis Dodge.— The variation among the specimens before us is very slight, being limited to shades of coloration, and the markings of hind femora. They conform with Scudder's description. The range of coloration was noticeable, the green varying from light to dark green. One exceedingly light colored female had doubtless been taken soon after last moult. The ground color varies from testaceous to greenish yellow.

Of the femur Scudder says "testaceous yellow with two broad angulate and sagittate bands darkest above;" our specimens present these features and in addition a basal spot which sometimes takes the form of a third oblique stripe. In some these angular bands fuse so as to cover almost the entire surface of the femur. The pallid base of hind tibiae mentioned by Scudder takes in our specimens the form of a clearly defined annulus.

Fourteen males, four females (Ford county) one female (Russell county). July; common both in pastures and cultivated crops, a rather late species being most abundant in August.

AMERICAN FOSSIL COLEOPTERA REFERRED TO THE SCOLYTIDAE.

BY A. D. HOPKINS, MORGANTOWN, W. VA.*

I have been greatly interested in studying the tertiary Scolytids and the work of a prehistoric beetle in wood from interglacial clays,† which you so kindly intrusted to me for that purpose.

At best the Scolytidae are a troublesome lot to study, even with a large series of perfect specimens, and it is often quite difficult satisfactorily to refer the species to their natural position.

Therefore when we come to deal with partially preserved remains and impressions of forms which were buried in the mud of tertiary lakes, it

* In a communication to S. H. Scudder.

† The results of the examination of the fossil Scolytid borings will be published elsewhere.— S. H. S.

is not to be expected that anything very definite can be determined regarding their specific, generic, or even group positions. At first glance it seemed a hopeless task to even approximate an opinion which would have any value. Yet, with a certain familiarity coming from a special study of existing forms, it is remarkable what one of these little dark spots and fragmentary impressions in the rocks will reveal. The outlined form, distorted as it may be, suggests a possible affinity. A peculiar arrangement of elevations (representing punctures or depressions in the prothorax or elytra), and depressions, representing in a like manner elevations, give a clue to some general characters; obscure lines become distinct and represent the position of sutures, and the comparative length of segments; faint symmetrical depressions indicate the form of the eyes; finer details, as punctures, rugosities, striae, and interspaces become more and more distinct, and we are reminded of similar characters in existing forms. After measuring, magnifying, sketching, and comparing, the perfect form is resurrected in our mind, and we have a basis upon which to form an approximate hypothesis of the position the individual would hold among the living descendants of the primitive division it represents.

The results of my studies of the five specimens of fossil beetles, including the types of your *Dryocoetes carbonarins*, *Dryocoetes impressus*, and *Hylesinus extractus*, may be indicated as follows:

No. 3999. *Dryocoetes carbonarius* Scudd. *Type*: from "Crossing Green Riv. Un. Pac. R. R." This seems to me not to belong to Dryocoetes, but to represent an extinct genus of doubtful group or even family position, although it appears to come closer to the Scolytidae than to the Curculionidae or Ptinidae, to both of which there is some suggestion of affinity.

The absence of antennae, legs, abdominal segments, and the tip of the elytra leave only the evident double or divided eye, the longitudinal rugosities and punctures of the prothorax, the faintly defined punctures of the elytra, and the obscurely outlined form, to suggest its family, group, or generic position.

The longitudinal rugosities of the thorax suggests an affinity to some Bothrosterni (Cnesinus), while the divided eyes would place it in either Hylesinides near Polygraphus, or Corthylides near Trypodendron (Xyloterus). This combination of characters would certainly exclude it from any Scolytid genus known to me.

No. 44 (15218) *Dryocoetes impressus* Scudd., *Trypodendron impressus*, (Type), and the attending series, 4048, 4009, under the same name, and all from "Crossing Green River, U. P. R. R., Wyoming," evidently represent one species, which is distinct from, and apparently allied to the preceding.

The longitudinal rugosities of the prothorax are much stronger and the punctures of the elytra, striae, and interspaces (represented by elevations) are of equal size, much more distinct, and arranged in approximate rows, while the elytra (type) are plainly narrowed towards the tip. These characters seem to be sufficient to exclude it from the Scolytidae, and to point to the Ptinidae as the family to which it may more properly belong. If so, it would come close to your *Anobium ovale* and *Anobium deceptum* (Figs. 1 and 18, Pl. 8, Tert. Ins. N. A.) with which the elytral punctures agree almost exactly. By reference to the descriptions and figure of *Polygraphus wortheni* Scudd. (Tert. Rhynch. Col. p. 158, Pl. XII, Fig. 13), it would seem that this, too, would belong to the same division of the Ptinidae, since the elytra narrowing towards the tip, the form of the prothorax, and the rather coarse, confused punctures of the elytra would remove it from Polygraphus.

5647. *Hylesinus extractus* Scudd., Type. "Florissant, Col." This is a true Scolytid, and belongs in the *Hylesinides*, which, according to my present arrangement includes subgroups *Phloeotribi*, *Polygraphi*, *Hylurgi* and *Hylesini*.

The granulated surface of the prothorax, referred to in the description, evidently represents slightly rugose dense punctures, especially on the side. The elytral sculpture is obscure, yet it plainly indicates an elevated rugose base common to the *Hylesinides*. The first four abdominal segments are, upon close examination under the microscope ($\frac{1}{2}$ inch objective), quite clearly defined, and show that they gradually decrease in length from the first to the fourth, as in Polygraphus, but quite different from Hylesinus, in which the first and second are longer, the third and fourth short. Upon careful examination, it is also noted that the eyes are divided and close to the base of the

Hylesinus extractus Scudd.

mandibles, as in Polygraphus. It, therefore, appears to belong near Polygraphus, but probably represents an extinct or undiscovered genus.

Your (8068) *Cytilus dormiscens*, Plate 1, Fig. 1, Tert. Rhynch. Col., seems from the figure to come very close to this species, especially in the form of the prothorax and the divided eyes. I might also add that fig. 11 of the same plate (*Cratoparis arcessitus*, No. 185) resembles somewhat Phloeosinus as does fig. 4, pl. IX. (*Exomias obdurefactus*, No. 1005), except that in the latter the eyes are divided.

THE SPECIES OF HADROTETTIX, A GENUS OF OEDIPODINAE.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Hadrotettix was established in 1876, on a clumsy, strikingly banded Oedipodine with long and rather coarse antennae, from the Arkansas River, described by Say as *Gryllus trifasciatus* and figured in 1828 in his American Entomology. No species has since been added to the group,* although one from Nebraska has been catalogued by Bruner on several occasions. I have for some time had in my collection a Mexican species of very different appearance, so far as the markings of the wings go, and recently Mr. Morse has brought from California still another widely different species. Accordingly I append descriptions of the two additional species, leaving that named by Bruner to be described by him. The four species known to me may be separated by the following table: —

Table of the species of Hadrotettix.

a^1. Wings crossed by a broad fuscous band, as broad as the metazona, and following the hind border nearly to the anal angle; hind tibiae coral red.

b^1. Band of wings with no taenia directed toward the base in the humeral field . . *trifasciatus.*

b^2. Band of wings sending a humeral taenia at least one third the distance toward the base of the wings . . . *gracilis.*

a^2. Wings crossed by a narrow band not following the hind border toward the anal angle, or by a mere cloudy infuscation.

b^1. Nearly the whole apical half of tegmina membranaceous, the dense reticulation of the base extending but little beyond the middle; wings crossed by a distinct narrow fuscous band with a humeral taenia; hind tibiae greenish yellow . *mundus.*

b^2. Only the apical fourth of tegmina membranaceous, the rest densely reticulated; wings merely obscured with fuscous clouds just beyond the middle and on the hind border; hind tibiae reddish yellow . . *nebulosus.*

*Thomas, however, twice described the original species under new names.

Hadrotettix trifasciatus.

Gryllus trifasciatus Say, Amer. ent., iii., pl. 34 (1828).

Oedipoda trifasciata Walk., Cat. Derm. salt. Brit. Mus., iv, 729 (1870).

Hadrotettix trifasciatus Scudd., Ann. rep. chief eng., 1876, 511 (1876).

Arphia trifasciata Caulf., Rep. ent. soc. Ont., xviii, 70 (1888).

Oedipoda pruinosa Thom., Proc. acad. nat. sc. Philad., 1870, 80 (1870).

Oedipoda hoffmanii Thom., Rep. U. S. geol. surv. terr., v, 127 (1873).

I have specimens before me taken on the explorations for the N. Pacific R. R.; from the Upper Missouri and Yellowstone Rivers; from south of the Black Hills, S. Dak., Nebraska City, Nebr., Colorado (Morrison), Pueblo, Col., Texas (Lincecum), Dallas, Tex. (Boll), Bosque Co., Tex. (Belfrage), Eagle Pass, Tex. (Schott), Pecos River, Tex. (Pope), and Fort Buchanan, Ariz. It has been reported from many of these districts by others, and also from Alaska [by error?] (Caulfield), Assiniboia (Scudder), British America (Bruner), Dakota and Montana (Bruner), Wyoming (Thomas, Bruner), Nevada (Thomas), Utah (Thomas, Saussure), Arkansas River (Say), and New Mexico (Scudder, Thomas, Saussure), so that it probably inhabits the whole Rocky Mt. region west of the eastern margin of the Great Plains, and east of the Sierras, from Assiniboia to the southern borders of Texas.

Hadrotettix gracilis.

Hadrotettix gracilis Brun.! MS., Publ. Nebr. acad. sc., iii, 25 (1893).

I have specimens from Valentine and Fort Robinson, Nebr., and Hot Springs, S. Dak., received from Bruner; as well as from Las Animas, Col., Bosque Co., Tex., and Fort Whipple, Ariz. It therefore has probably much the same range as the preceding. It is a little smaller than that species. I have also received this species from Bruner as coming from Nebraska and labelled *H. minor* Brun. MS.

Hadrotettix mundus sp. nov.

Moderately slender for the genus; brownish plumbeous, occasionally ferruginous, often and especially in the male more or less albescent, particularly on the head; the latter well rounded, rather prominent, the fastigium of vertex slightly impressed, with a weak median carina, the frontal costa not very broad, expanded a little below the ocellus, a little sulcate and punctate, especially in the male; antennae scarcely (♂) or a little (♀) shorter than the hind femora, dull ferruginous, alternating obscurely with dull testaceous, often pallescent toward base. Pronotum of nearly uniform coloring, brownish plumbeous or ferruginous, but with the lateral lobes often more or less feebly albescent, particularly in the male, rarely obscurely punctate with fuscous, the lateral carinae prominent but rounded on the metazona, which is feebly rugulose and posteriorly rectangulate or subrectangulate. Tegmina brownish at base, beyond pale cinereous or albescent, crossed by two conspicuous heavy fuscous bands and a broken third band, often with a few obscure maculations apically, the dense reticulation of the base scarcely extending beyond the middle; wings pale citron yellow at base, crossed in the middle by a fuscous band scarcely if any wider than one of the bands of the tegmina, narrowed and interrupted at the lower margin of the humeral area, reaching the hind border but not following it toward the anal angle, sending a humeral taenia half way to the base, the wings beyond the band pellucid with infuscated veins and a fuscous costal margin. Hind femora cinereous, banded in the middle of the apical half with fuscous, followed by a subflavous pregenicular band; hind tibiae pale greenish yellow, sometimes with a genicular fuscous maculation or cloud.

Length of body, ♂, 25 mm., ♀, 31 mm.; antennae, ♂, 12.5 mm., ♀, 14 mm.; tegmina, ♂, 25 mm., ♀, 29.5 mm.; hind femora, ♂, 13 mm., ♀, 16.5 mm.

16 ♂, 16 ♀. California, at Gazelle, Sept. 4–5, Tehama, Aug. 28, and Tulare, Aug. 5, A. P. Morse.

Hadrotettix nebulosus sp. nov.

Moderately stout; pale cinereous, more or less albescent. Head well rounded, not very prominent, the fastigium of vertex very obscure with no median carina, the frontal costa not very broad, feebly sulcate, punctate above; antennae a little shorter than the hind femora (♀), testaceous, infuscated in apical half by alternating bands of obscure fuscous. Pronotum brownish fuscous on metazona, pale cinereous on prozona, the lateral carinae bluntly rounded on metazona and hardly prominent; process of metazona rounded obtusangulate. Tegmina densely reticulated except the apical fourth, brownish fuscous at base, beyond dull cinereous, twice not very conspicuously banded with dull fuscous, with signs of a third band, and with obscure fuscous apical maculations; wings pellucid, fuliginous in a moderately broad band just beyond the middle, which is feeble in front, more marked behind, where it follows the hind border a short way toward the anal angle. Hind femora flavo-testaceous, twice banded interiorly with black or blackish fuscous, showing also above somewhat; hind tibiae pale reddish yellow, ringed at base with black and again obscurely in the middle of the basal half.

Length of body, 29 mm.; antennae, 13 mm.; tegmina, 27 mm.; hind femora, 15.5 mm.

2 ♀. Sinaloa, Mex., Koels (Behrens).

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Mecoceras nitocris Cram. The larva has not been previously described. Druce gives full references in the Biologia Cent.-Am., Lep. Het., ii, 94.

Egg. Cylindrical, the ends rounded, one end a little more taperingly so than the other; a scarcely perceptible flattening of the cylinder, parallel to the leaf as laid. Twelve neat low ribs, reaching almost to the smaller end, becoming dotted at termination; stopping abruptly at the larger (micropylar) end in a circle of large, quadrangular, indistinctly edged cells, at the inner angles of which are a circle of white dots, one for each rib. Within this the micropyle is somewhat coarsely reticulate. Ribs thickly crested with a double alternating row of white dots. Cross-stria fine, parallel, faint. Fine dark green; the ribs and circle of dots appear white. Size .65 × .55 × .50 mm.

Stage I. Head rounded, not bilobed, brown-black, not shining; width .3 mm. Body cylindrical, slender, feet normal; central parts of segments bearing tubercles i and ii larger, collared, 2-annulate, the intersegmental parts smooth; ends shrunken. Dark vinous, almost blackish, the slender, intersegmental parts of joints 5 to 9 pale, sordid whitish with dorsal and subdorsal vinous lines, so that the body looks obscurely dark vinous banded. Tubercles small; setae black, stiff, iv behind the spiracle; on thorax ia to iib all separate, no subprimaries. A small trapezoidal cervical shield and rounded anal plate.

Stage II. Head broad, the lobes produced with short points directed forward; sutures impressed; dull, dark black-brown, a little mottled; secondary hairs present, short, black; width .5 mm. Body slender, the centers of the segments a little swollen; all dark blackish vinous with an olivaceous tint, under the lens obscurely finely lined longitudinally with darker ventrally. In the position of tubercle iv an elevated rounded dark spot. Segments centrally dorsally shaded with dark. Skin covered with fine, short, dark, secondary hair arising from black tubercles. Venter of joint 10 protruded, the segments finely annulate, all essentially as in the mature larva, though darker.

Stage III. With the characters of the mature larva. Head .7 mm. The black rounded stigmatal lumps and the paired posterior dorsal ones present on joints 8 and 9, the latter one smaller. Dark, blackish brown, a little lighter and greenish ventrally, peppered by the dark secondary tubercles. The fine secondary setae black. Head points distinct. The ends, joints 2 to 4 and 10 to 13, are nearly black. No marks nor lines.

Stage IV. Head bilobed, the lobes produced into cones with sharp tips curved forward, not long but pointing obliquely forward and outward; clypeus as high as two thirds of the front; cheeks rounded. quadrate below, mouth projecting. Blackish, dotted with pale, an irregular white fleck on the face of the lobe below the horn; densely covered with short, black, secondary pile; width 1.4 mm. Body as in the next stage, the color darker, less green, the prominences a little less pronounced.

Stage V. Head bilobed, the former points represented by slight elevations on the upper front side; color as before; width 2.1 mm. Body nearly cylindrical, the subventral fold distinct and arched on the segments; a pair of short, erect, black lumps on joints 8 and 9 in the position of tubercle ii, those of joint 8 the larger; a slight elevated black spot in the position of tubercle iv on joints 5 to 9; venter of joint 10 protruded. Body all densely covered with fine, black, secondary pile from small black tubercles, almost spiny on the dorsal elevations. Dull olivaceous green, the green predominating with growth, though some examples remain vinous to the last, shaded with brown, especially in the centers of the segments dorsally and on the posterior rims, darkest on the contracted end parts; a series of fine medio-ventral dashes; segments very obscurely 8-annulate; spiracles white, black rimmed; feet brown.

The larva pupates in the sand, spinning a very slight cocoon of silk. The slender light brown pupa has long projecting leg cases.

Food plant, *Coccoloba floridana*, only the young leaves being eaten. Larvae from Palm Beach, Florida.

SOME COCCIDAE QUARANTINED AT SAN FRANCISCO.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

Mr. A. Craw has recently sent me a fresh lot of Coccidae, which he detected on plants about to be landed at San Francisco; and it is interesting to note that, even after so many years of horticultural quarantine, new species are met with. Thus we can never know what new pest may arrive at our ports, the absence of an insect in the past proving nothing in regard to the future.

1. *Antonina crawi*, n. sp. — ♀ in a closely felted white sac, about 4 mm. long, with a long, white, brittle, glassy tail projecting from the hind end; ♀ removed from sac, $3\frac{1}{2}$ mm. long, $1\frac{2}{3}$ broad, subcylindrical, smooth,

purple-black, with much the color and surface of a prune; abdomen segmented, cephalic end truncate, subemarginate; boiled in liquor potassae, it turns the liquid a beautiful deep reddish-purple, or plum color. Skin hyaline after boiling, with very numerous round glands of two sizes; antennae conical, rudimentary, obscurely 4-jointed, about 54 μ long; no legs; spiracles moderate; anal tube about 180 μ long, and 105 μ broad, at its mouth very thickly beset with round glands, and having short, stout spines at its sides; anal ring with six long, stout bristles extending the whole length of the anal tube.

Hab. — Japan, on bamboo, at sheathing bases of leaves. Very close indeed to *A. purpurea* Signoret, but larger; I am not sure it is more than a subspecies of *purpurea*, which, however, lives at the other end of the palaearctic region.

2. *Pseudolecanium tokionis* (Ckll.). — Japan, on bamboo. Females, 6 mm. long, are yellowish white, which appears to be the color of the insect until the latest stage. Mr. S. I. Kuwana has recently found this species on bamboo at Stanford University, California.

3. *Asterolecanium variolosum* (Ratz.) var. *japonicum*, n. var. — ♀. Scale only about 1 mm. diam., greenish or pallid; fringe very short, pinkish; ♀ pinkish when alive, turning orange in liquor potassae; margin with two rows of glands, one minute, simple, the other figure-of-8, thirteen figure-of-8 glands in 150 μ; scattered tubular glands.

Hab. — Japan, on *Quercus glandulifera* Blume, inhabiting the bark of the twigs, with *Aspidiotus cryptoxanthus.* Perhaps a distinct species, but the tangible differential characters are few, as usual in the genus.

4. *Lecanium cerasorum*, n. sp. — ♀. Globose, very convex, $5\frac{1}{2}$ mm. long and wide, about 4 mm. high, shiny, pale ochreous, soft, with scattered pits, having much the color and texture of a ripe berry of *Melia azedarach;* anal region suffused with reddish brown; a good deal of white cottony secretion inside (beneath) the scale, not visible on the outside. Skin with tubular glands; anal plates ordinary; area around anal plates for quite a distance strongly tessellate in *Saissetia*-fashion; marginal spines small and simple; anal ring with about seven stout bristles, about 210 μ long; mouth-parts small, transverse diameter about 210 μ; legs and antennae small; coxa about 75 μ long, femur stout, with trochanter about 140 μ, tibia about 90 μ, tarsus about 75 μ, claw large; antennae 6-jointed, 3 very long (about 90 μ), the others all about 30 μ, except 5, which is about 24 μ.

Hab. — Japan, on bark of twig of cherry tree. In color and shape it resembles *L. globulosum* Maskell, but differs at once by the strong tessellation of the anal area.

5. *Aspidiotus* (*Diaspidiotus*) *cryptoxanthus*, n. sp. — ♀. Scale on bark of twigs, almost invisible, its color being that of the bark, about $1\frac{1}{4}$ mm. diameter, circular to suboval, often massed, very slightly convex, with covered deep orange-red exuviae, very conspicuous when exposed by rubbing; young scales with a dot and ring; scales removed from the bark leave a whitish patch. ♀ bright orange when alive; five groups of circumgenital glands, median of 4 to 5, anterior laterals of 10, posterior laterals of 7 to 8; two pairs of lobes; median lobes contiguous in the middle line, large, produced, broadly rounded at ends, with the long outer slope crenulate; second lobes similarly formed but much smaller, separated by an appreciable interval from the first; third lobes represented by a small nodule; squames short and pointed, dagger like, inconspicuous, the best developed are a pair at the second interlobular incision; spines quite large; interlobular incisions with chitinous thickenings, the inner one of the first incision nearly straight but greatly swollen; anal orifice small and round, very near to hind end.

Hab. — On bark of twigs of *Quercus glandulifera*, in Japan. Differs from the European *A. zonatus* by the longer median lobes, crenulate on outer side; more produced second lobes, also crenulate; longer spines, etc.

6. *Aspidiotus lataniae* Sign. — On a cocoanut palm from Central America. The living ♀ is bright lemon yellow; the second and third lobes are represented by little spear-head shaped lobules, as Green figures in *A. camelliae*.

7. *Spatheaspis secreta* (Ckll.) — Japan, on bamboo. The living ♀ is pale pinkish lilac, with the caudal parts brown; caustic potash turns the ♀ bright apple green. Eggs pale lilac.

8. *Spatheaspis bambusarum* (Ckll.). — Japan, on bamboo. I am willing to recognize *Spatheaspis* (or *Odonaspis*) as a valid genus, and *Froggattiella* Leonardi (type *Spatheaspis inusitata*) as a good subgenus of it; but it seems to me that *Anoplaspis* Leonardi (type *S. bambusarum*) is scarcely to be separated from *Froggattiella*.

9. *Chrysomphalus scutiformis* (Ckll.). — On leaves of cocoanut palm from Central America.

Some mating notes.—In the summer of 1899 several larvae of *D. rubicunda* were brought me. They were nearly full fed and soon pupated. On Aug. 3rd a ♀ moth emerged and began ovipositing before her wings were fully developed, and before 3 p.m.

The next day two males emerged in the same cage, and one must have mated with the female, although I did not see them in coition.

The sixty eggs laid before the males emerged remained unchanged, while those laid later became orange, then greenish, then almost colorless, and hatched on August 20th.

This is the first instance I have had of a ♀ moth's mating after ovipositing had begun.

On April 10th, 1900, a ♂ *A. cecropia* emerged in one of my cages. Next day a ♀ and a second ♂ emerged, and after midnight the ♀ and the first ♂ mated. The following night the ♀ laid 31 eggs. On the next night she laid 64 eggs, on the next 48 eggs, and on this night she mated with the second male, remaining in coition from a little after midnight until 6.15 p. m.

On this night she laid 73 eggs, and continued ovipositing for two nights, laying 269 eggs in all, then died next day. The two males died on the day following their mating. *Caroline G. Soule.*

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NO TEON THE ORTHOPTERAN GENUS LEPRUS SAUSSURE.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In my recent Catalogue of the Orthoptera of the United States I have given, p. 36, three species of Leprus as found in the west: *L. corpulentus* Sauss., *L. intermedius* Sauss , and *L. wheeleri* Thom. sp.

L. corpulentus was given on account of a single specimen from Texas in my collection, which I had referred to that species. A closer study of my material, mainly from Mexico, leads me to the conclusion that Saussure's two species *L. elephas* and *L. corpulentus* are the same, my specimens, twenty-six in number, varying considerably in all the points on which he relies to separate the two forms, and by no possibility resolvable into two series. The name *L. corpulentus* of my Catalogue should therefore be replaced by the older name *L. elephas* Sauss. My males vary in length of tegmina from 25 to 29 mm., my females from 26 to 43 mm., the small female (a single specimen) coming from Arizona. My United States specimens come from Fort Whipple, Ariz. (E. Palmer), forty miles east of Tucson, Ariz. (Palmer), and Ringgold Barracks on the lower Rio Grande, Tex. (Schott). My Mexican specimens come from Sonora (Schott), San Luis Potosi (Oct. 15, E. Palmer; Oct. 6, G. Barroeta), Mountains twelve leagues east of San Luis Potosi (Palmer), and Sierra Nola, Dec. 3-6 (Palmer).

L. intermedius, described from one sex (♀) by Saussure as coming from California, I had not recognized when my Catalogue was printed. My only Californian specimens of Leprus belong to a species, noted below, allied to *L. wheeleri*, with blue hind wings, and which do not differ from *L. elephas* in the way *L. intermedius* is said to differ from it. Latterly I have recognized *L. intermedius* in specimens from British Columbia collected by Crotch, which are somewhat smaller than Saussure's specimen, a female having the length of the tegmina only 25 mm.

L. wheeleri has been determined both by Prof. L. Bruner and myself from Thomas's type, and in life has the disk of the hind wings blue and not yellow as heretofore described. Saussure evidently never saw it, as he redescribes it from Thomas's description, which was based on alcoholic specimens. It varies but little in size, the tegmina of the male varying from 26 to 28.5 mm. in length, and of the female from 32 to 35.5 mm. My specimens come from Humboldt Station, Nevada, July 29, Salt Lake Valley, Utah (Bruner), Pueblo, Col., Aug. 30–31 and Dripping Springs, Organ Mts., N. Mex. (Cockerell). It was originally described by Thomas as taken by Wheeler's expeditions in the west without specification of locality. Saussure gives it as from New

Mexico, but with no apparent reason, though it is found there as stated above and indeed has been already credited to Grant Co., by Townsend.

As I have said above, there is a Californian species, hitherto undescribed, allied to *L. wheeleri* by its lesser size, hind wings blue at base and hind tibiae mostly blue, instead of, as in the larger forms and in *L. intermedius* as well, having the disk of the wings yellow and the hind tibiae yellow or red. It may be called *L. glaucipennis* and differs from *L. wheeleri* in that it is slightly smaller, the wings are of a paler blue (of the tint found in blue specimens of *Derotmema saussureanum* Brun.), the hind process of the metazona is distinctly acute and, except sometimes in the female, not subrectangulate,—though both species are variable in this respect like *L. elephas;* the lateral carinae of the pronotum are also more sharply angulate, especially in the female, the median carina a little more prominent, and the granulations of the pronotal disk more prominent and sharper. It varies little in size, and the following measurements are taken from average individuals: Length of body, ♂, 19 mm., ♀, 33 mm.; antennae, ♂, 8.5 mm., ♀, 12 mm.; tegmina, ♂, 22 mm., ♀, 34 mm.; hind femora, ♂, 12.5 mm., ♀, 21 mm. I have seen specimens from the following California localities: Point Loma, July 23, Los Angeles, July 25, and Rubio Wash, Altadena, July 29, all collected by A. P. Morse; and Santa Rosa Island, H. Edwards; also from Durango, Mex., E. Palmer, and San Luis Potosi, Mex., G. Barroeta.

THE MELANOPLI OF KANSAS.—II.

BY S. J. HUNTER AND W. S. SUTTON, KANSAS UNIVERSITY, LAWRENCE.

Melanoplus.

Lakinus Series.

M. lakinus Scudder.—Antennae a little more (male), or a little less (female) than two thirds the length of the hind femora. Frontal costa variably sulcate. Posterior expansion of the pronotum variable, in two specimens (males) subequal, prozona elongate in female and longer than metazona. In these characteristics it varies somewhat from Scudder's description and favors *M. sonorae* but is excluded from that species by its blue hind tibiae. On the hind femora there is a basal fuscous spot on the upper inner surface.

We have one female from Hamilton county which agrees with the specimens above described in general but has a broader interspace between the mesosternal lobes which forms the chief distinguishing characteristic of *M. marculentus*. Being an alcoholic specimen in this case the color markings distinguishing *lakinus* from *marculentus* are not to be implicitly relied upon, therefore, the exact position of the insect remains in doubt.

Two females from Ford county,

three males and five females from Hamilton county, July. Reported previously from Lakin, Kearney county.

M. marculentus Bruner. One male, Russell Co., August. This specimen manifests a trait liable to appear in short-winged varieties. It agrees with Scudder's description of *M. marculentus* with the exception of the darker coloring of the upper portion of the head and pronotum, and the greater length of the subgenital plate, but instead of the normal abbreviate wing the insect has well developed tegmina and wings. The tegmina extend clearly beyond the end of the abdomen and are remarkably broad for one of this genus. Width 6 mm., length 11 mm. (est.; the tips were frayed). Basal half testaceous, two or three testaceous spots on discoidal area. Wings hyaline, veins and cross-veins fuscous in distal portion, glaucous basally.*

Spretus Series.

This group as classified by Scudder contains seven species of remarkable similarity; five of the seven, however, exist, in the United States, only west of the Rocky Mountains. The other two, *atlanis* and *spretus*, are at times easily distinguished, and again specimens of each are found which in every particular fail to fit any written description we have met on the subject. The characteristics not shared by both seem to be the extreme flaring and flatness of the metazona in *spretus* and the more nearly rectangular form of the humeral angle as seen laterally in the same species.

M. atlanis Riley.— Genae and sides of pronotum varying from yellowish testaceous to dark griseo-fuscous. Markings of vertex of pronotum variable, vertex generally showing a dark mottled stripe widening posteriorly and a lighter mottled linear area between this and the eye. Sometimes the vertex is marked with irregular diffusion of fuscous. Dorsum of pronotum dark griseo-fuscous, sometimes uniform, and noticeably darker along the median line; or rarely, lighter in this position. Occurs quite generally over the State.

M. spretus Uhler.— In the field work of 1897 this species was erroneously reported upon the determination of another as having been taken in Edwards county that season.* The next season, 1898, a careful watch was kept for its presence, and on one morning it was decided to ascertain approximately the relative number of *spretus* and *atlanis* present along the county line between Edwards and Ford counties north of the Arkansas river. 100 specimens of these closely allied forms were taken, kept apart from other material, and determined. It was found that of this number 19 were *spretus* and 67 were *atlanis*. This

* We were unable to find reference to such a wing development in this species. Since writing the above, however, in conversation with Professor L. Bruner he informed me that he had taken a number of the long-winged males of *marculentus* in the vicinity of Colorado Springs, Colo. S. J. H.

* U. of K. Bull. Depart. of Ent., Oct., '97.

season again a special watch was kept for any *spretus* which might be taken during the collecting hours, resulting, as we had supposed from observations in the field, in the taking of no specimens of *spretus* whatever. On careful examination of this material, however, we find what we believe to be one specimen of *spretus*, a female. These notes are here recorded since the absence and recurrence of *spretus* is never without interest. Not present in this territory in 1897, we find it in limited numbers in 1898 and this season out of all the material taken during four weeks collecting in Hamilton, Ford and Russell counties but one doubtful specimen among the captures.

THE GENUS KERMES IN NORTH AMERICA.

BY GEO. B. KING, LAWRENCE, MASS.

When I first thought of writing upon this genus it was my intention to take up the European species, but owing to the fact that I have not yet been able to consult some of the more important European literature treating upon the species found, and also that I wish to possess or at least see most of the species, I have abandoned it for the present, and taken up our North American forms. As there are not sufficient specific microscopical characters in the adult female to formulate a table of the species I have thought it best to put them into sections, based upon a superficial examination of the female scale.

1. Section of *Kermes galliformis* Riley. Globular forms, or nearly so, segmentation obscure; not gibbous. *K. boguei*, *K. pubescens*, *K. nigropunctatus*, *K. kingii*, *K. ceriferus*, *K. pettiti*, *K. austini*, *K. grandis*, *K. perryi*, and *K. galliformis* var. *cueroensis*, n. var.

2. Section of *Kermes gillettei* Ckll. Scales gibbous, segmentation distinct, *K. concinnulus* and *K. cockerelli.*

3. Section of *Kermes nivalis* King, Ckll. Scales shaped like a convex *Lecanium*, not globular or gibbous.

4. Section of *Kermes andrei* King. Scales very convex, elongated or pyriform in shape.

Prof. Cockerell finds Boitard, in 1828, the earliest author to use *Kermes* as a true generic name. Of course *Kermes* (as he says) was used as a popular term for many years before Boitard's time, as will be seen when I treat of the European species. The total number of *Kermes* described is 26 and one variety, with one more yet to be named by Newstead, found in Africa. The name *K. quercus* was proposed for it, but this is preoccupied. Europe has 12 and North America 15 species and one variety. The *Kermesinae* therefore contains 27 species and one variety, all of which belong to one genus, *Kermes*. The localities which have produced new species in North

America are: New York, 1; Arizona, 1; Oklahoma, 1; Colorado, 1; Kansas, 2; California, 3; Massachusetts, 4; Mexico, 1; and one variety from Texas. Although *Kermes* were known before the time of Moses. there were none described from America until June, 1881. A brief synopsis of the species follow in the order in which they were originally described.

1. *Kermes galliformis* Riley, 1881. A large, dark, dirty gray form, which turns to a nearly clear white color when exposed a season on the twigs. ♀ scale 6 mm. long, 7 broad, 6 high, with black spots, and viewed with a hand lens the scale is seen to be covered with minute black specks. Newly hatched larva dirty gray. See tables. Originally described from Iron Mountain, Mo., and Silver City, New Mexico, the latter collected by Mr. H. H. Rusby, on *Quercus emoryi*, also recorded from Colorado, Florida, Connecticut, South Carolina, and Massachusetts. A new locality is Las Vegas, New Mexico, March, 1900 (Cockerell and Porter).

Bibliography. — American Naturalist, vol. 15, 1881, p. 482. U. S. Agr. Rept. 1880–81, p. 337. U. S. Entom. Com. 1890, p. 100. Can. Ent. vol. 31, 1899, p. 139.

1a. *Kermes galliformis*, var. *cueroensis*. Cockerell, n. var. "Large, transverse diameter 8 mm., convex, with no median constriction; brownish-white, obscurely marbled with very pale gray, with linear transverse brown bands, somewhat wavy, and thickened at intervals; surface minutely speckled with brown dots. On small branches of post oak (*Quercus* sp.), at Cuero, Texas, June 2, 1898, collected by Prof. C. H. T. Townsend" (T. D. A. Cockerell, MS.).

After my MS. was sent to the printer Prof. Cockerell sent me some of the young larvae of the above variety, and I find them very different from any yet described, and belong to the galliformis group; the following is a description of them.

♀ larvae light yellow, elongate oval, 400 long, 200 broad. Antennae 6-jointed, 3, 6 and 1 equal in length and longest, 2, 4 and 5 equal and short, nearly as broad as long. All the measurements are in micromillimeters, joints (1)20 (2)12 (3)20 (4)12 (5)12 (6)20. Formula (361)(245), 1, 4 and 5 have two short bristles. 6 seem to have about nine or ten, two of these at the apical and very long. Marginal spines point backward and slightly curved, not very stout, 12 long. Caudal tubercles long, each with a long bristle 140 long, and three stout spines 20 long. Legs normal with the coxa 20 long. Femur with trochanter, 64; tibia, 28; tarsus, 48; claw, 16. Coxa, 36 broad. Femur with trochanter, 28; tibia, 16; tarsus, 16. The tarsus diminishes in breadth rapidly near the claw. Digitules of tarsus and claw normal, with small knobs. Mentum and rostral loop tinged with yellow, all the other parts are colorless after boiling in K. H. O.

2. *Kermes gillettei* Ckll., 1895. ♀ scale 8 mm. long, 7.5 broad, 7 high. Segmentation distinct, dorsum with round tuberosities, general coloring white and dark brown mottled, usually with a white dorsal band. Young larva pale purplish pink. Antennae 6 jointed, 3 and 6 equal and longest, 4 and 5 equal and shortest and about as long as broad, 2 a little longer than 4 and much shorter than 3, 3 about as long as 4 plus 5. Formula (36) 2 (45). Described from Manitou, Colorado, on *Quercus undulata*. Coll. by Prof. Gillette, Nov. 26, 1894, also found in New Mexico, in Santa Fé Canon (Cockerell), and at Beulah (Cockerell and Porter, March, 1900).

Bibl. — The Entomologist, London, 1895, p. 101. Hemiptera of Colorada, 1895, p. 126. PSYCHE, vol. 9, 1900, p. 44.

3. *Kermes boguei* Ckll., 1897. ♀ scale globular, 6½ mm. long, 5¾ broad, 5 high, smooth, not shining. Color dark, irregular

blotching of scarlet, black and dull white; young larva reddish purple (after boiling). Antennae 6 jointed, 3 longest, 6 nearly as long as three, 2 broader than long, 5 shortest. Formula 36 (21) 45. Hab. about 10 miles from Stillwater, Oklahoma, on *Quercus alba*. Coll. by Prof. Bogue, Aug. 26, 1896.

Bibl. — Entomological News, vol. 8, 1897, p. 94. PSYCHE, vol. 9, 1900, p. 44.

4. *Kermes grandis* Ckll., 1898. ♀ scale globular, 10 mm. in diameter, surface dull, marbled with black gray and white. Hab. — Amecameca, Mexico, on *Quercus engelmanni*. Coll. by Mr. Koebele, May 25, 1897.

Bibl. —Ann. and Mag. Nat. Hist., ser. 7, vol. II., June, 1898, p. 431. Biol. Centr. Amer. Rhynch. Homop. vol. 2, Pt. 2, Dec., 1899, p. 10. PSYCHE, vol. 9, 1900, p. 44.

5. *Kermes pubescens* Bogue, 1890. ♀ scale globular, $3\frac{1}{2}$ mm. in diameter, 3 high. Color light brown, with suffused dark brown bands marking the obscure segments. Surface shining, minutely pubescent. Hab. — Manhattan, Kansas, on *Quercus macrocarpa* and *Q. prinoides*. Coll. by Mr. Norton, Nov. 14, 1897, also found at Lawrence, Andover, and Methuen, Mass., on *Quercus alba* and *Q. rubra*. Coll. King, July, 1898.

Bibl. — Can. Ent. vol. 30, 1898, p. 172. Can. Ent., vol. 31, 1899, p. 139. PSYCHE, vol. 9, 1900, p. 44.

6. *Kermes concinnulus* Ckll. 1898. ♀ scale $4\frac{1}{2}$ mm. broad, $3\frac{1}{2}$ high, very convex rounded in front, flattened behind. Color lively ochreous, surface shining, segmentation very distinct. Hab. — Manhattan, Kansas, on *Quercus macrocarpa*. Coll. Mr. Norton, Nov. 14, 1897.

Bibl. — Can. Ent. vol. 30, 1898, p. 172. PSYCHE, vol. 9, 1900, p. 44.

7. *Kermes cockerelli* Ehrh. 1898. ♀ scale 5 mm. long, 4.5 broad and 4 high, deeply segmented. There is a broad median longitudinal grove where the segmentation is obsolete; on each side of this the segments are strongly gibbous. Color light brown. Larva yellow. Antennae 6 jointed. Formula 36 (12) 45. Hab. — Mountain view, California on *Quercus lobata*. Coll. Mr. Ehrhorn June, 1898.

Bibl. — Entomological News, vol. 9, 1898, p. 185. PSYCHE, vol. 9, 1900, p. 44.

8. *Kermes nigropunctatus* Ehrh. and Ckll. 1898. ♀ scale globular 4.5 mm. long, 5.5 broad, nearly 4 high, not very pale ochreous, speckled all over with black, specks very small. Segmentation obscure. Larva oval, pink. Antennae 6-jointed. Formula 361 (45) 2. Hab.— Los Angeles, California, on *Quercus* sp. Coll. by Mr. Craw, June, 1898. In Mexico; mouth of San Diego Canon, Sierra Madre, State of Chihuahua, on live oak, *Quercus* sp. Coll. by Prof. Townsend, May 22, 1899. Originally described from California.

Bibl. — Entomological News, vol. 9, 1898, p. 186. Biol. Centr. Amer. Rhynch. Homop. vol. 2, pt. 2, 1899, p. 10. PSYCHE, vol. 9, 1900, p. 45.

9. *Kermes nivalis* King and Ckll. 1898. ♀ scale *Lucanium*-like in shape, $4\frac{1}{2}$ mm. long, $4\frac{1}{2}$ broad and 3 high. Color dark sepia-brown, irregularly marbled with black and pale ochreous. The entire scale is covered with a thick coating of snow-white powder. Hab. — Lawrence, Mass., on *Quercus alba*. Coll. by King, July 28, 1898.

Bibl. — Ann and Mag. Nat. Hist. Ser. 7, vol. 2, Oct. 1898, p. 330. Can. Ent. vol. 31, 1899, p. 139. PSYCHE, vol. 9, 1900, p. 44.

10. *Kermes kingii* Ckll. 1898. ♀ scale globular, 5 mm. long, $4\frac{1}{3}$ broad, $3\frac{1}{2}$ high. Color bright light ochreous, slightly marbled with a darker redder tint, with a pale mid dorsal line. Hab. — Lawrence, Mass., on *Quercus rubra*. Coll. by King, July 28, 1898. Also found by Prof. Gillette a few years previous in Delaware, and then taken for *K. galliformis*.

Bibl. — Ann. and Mag. Nat. Hist. Ser. 7, vol. 2, 1889, p. 330. Can. Ent. vol. 31, 1899, p. 139. PSYCHE, vol. 9, 1900, p. 44.

11. *Kermes ceriferus* Ehrh. 1899. ♀ scale globular 4 to 4½ mm. in diameter. Color brown, shiny, dotted with black spots and coated with a dirty white wax. Larva reddish. Antennae 6 jointed, 3 and 6 about equal, 1 and 2 equal, 4 and 5 equal. Formula (63) (12) (45). Hab. — Walnut Creek Canyon near Flagstaff, Arizona, on *Quercus* Sp.

Bibl. — Can. Ent. vol. 31, 1899, p. 5. PSYCHE, vol. 9, 1900, p. 44.

12. *Kermes pettiti* Ehrh. 1899. ♀ scale globular, 4 mm. long, 4 broad, 3½ high. Color french yellow with black spots and obscure black specks (visible only with a hand lens, as in *galliformis*), with a prominent longitudinal constriction. The young larvae are yellow, and resemble structurally those of *galliformis*, whose larvae are dark gray. *Pettiti* scales do not lose their yellow color in the cabinet, as do *galliformis; K. pettiti* is very near to *galliformis*, but nevertheless it is a valid species. Prof. Cockerell informs me that the material was small and poor from which Mr. Ehrhorn described, and according to one of the type lot sent me, it seems as though there was another species mixed with his lot of a reddish-brown color, with darker brown spots. I find these in Massachusetts also with *K. pettiti*, and think this will prove to be a new species when its larva is found. Hab. — Ithaca, N. Y., on *Quercus Sp.* Coll. by Mr. Pettit, 1898, at Lawrence, Mass., on *Quercus alba* and *Q. rubra*, Sept. 1897. Coll. by King, also found by Dr. Fletcher in Canada.

Bibl. — Can. Ent., vol. 31, 1899, p. 7. PSYCHE, vol. 9, 1900, p. 22. PSYCHE, vol. 9, 1900, p. 45.

13. *Kermes austini* Ehrh. 1899. ♀ scale globular, 4.5 mm. broad, 4 long and 4 high, color light brown with several irregular white stripes running parallel with the segments. Young larva pink. Antennae 6 jointed, 3 longest then 6; 2 and 5 subequal, 1 and 4 about equal. Formula 36 (25) (41). Hab. — Guejito Mountains, eight miles east of Escondido, San Diego Co., California on *Quercus oblongifolia*. Coll. by Mr. Austin, 1898.

Bibl. — Can. Ent. vol. 31, 1899, p. 104. PSYCHE, vol. 9, 1900, p. 44.

14. *Kermes andrei* King. 1900. ♀ scale very convex, 5 mm. high and 5 in diameter at its base, surface shining. Color light-brown with three and sometimes four dark brown bands. Hab. — Lawrence, Mass., on *Quercus alba* and *Q. rubra*. Coll. King, Sept. 9, 1899.

Bibl. — PSYCHE, vol. 9, 1900, p. 22. PSYCHE, vol. 9, 1900. p. 44.

15. *Kermes perryi* King n. sp. ♀ scale occurs on the twigs in clusters of 8 to 14. Shape, very globular, small, 3 mm. in diameter. Superfically examined, its color appears to be dark gray, dull, not shining, very near the color of the bark upon the twig. Viewed with a hand lens the segmentation is nearly obsolete and indicated by fine black lines, upon a dark yellowish brown surface. Parallel with the segments are several depressed dots, which are darker than the surface. The entire surface of the scale is covered more or less with a dirty white wax; under a low power of the microscope this appears to be small white granular crystals. Boiled in K. O. H. it turns the liquid dark brown. Dermis by transmitted light colorless, with small round gland-orifices. Rostral loop long, and stout. Antennae short, stout, 108 long. Apparently six jointed but the joints are indistinct, joint 1 is 80 broad, 6 is 20 broad, 3 appears to be the longest, the 6 has several short hairs. ♀ larva (newly hatched) dark yellow, oval, broader in front than behind, not elongate as in some species, 412 long, 240 broad at middle pair of legs. Antennae 6 jointed, joint 3 longest, then 6; 1 and 5 next and equal 2 and 4 shortest and equal. Formula 36 (15) (24), all of the joints have hairs except 1 and 2 more being upon 5 and 6, three of these are very long. Rostral loop stout, reaching a little beyond last pair of legs. Legs normal. Coxa 24

long. Femur with trochanter 76. Tibia 32. Tarsus 52. Claw 16. Tarsal and claw digitules quite long, slender and knobbed. Caudal tubercles quite large, 40 long, 28 broad at the base, each bearing one long bristle 120 long, and three short stout spines 16 long. The marginal spines a little curved and point backwards, these are 12 long. The space between each being 20. All the measurements are in micromillimeters. Hab.—Lawrence, Mass., on scrub oak. *Quercus ilicifolia*, July 28, 1898. It is very distinct from all other American *Kermes*, and the smallest yet found. Its nearest ally is evidently *Kermes ceriferus* Ehrh. but is easily separated from that species, by its much smaller size of the ♀ scale. The young larva also differ very materially from *K. ceriferus* and cannot be confounded with *K. nigropunctatus* which is large and pale ochreous, with minute black spots and a median longitudinal depressed line. It is nothing like *K. pettiti* Ehrh. which is a very common species in Massachusetts. This species is named after Mr. A. F. Perry for his many kind favors shown me in my laboratory work.

THE LARVAE. All of our young larva of *Kermes* seem to be oval or elliptical in shape; and all very similar structurally, excepting *K. pubescens*, described below. They have well developed caudal tubercles, with one very long setae, and usually three stout spines, excepting in *K. boguei*, which has the long setae and only one spine, and *K. gillettei*, which has the long setae and two spines. The antennae are all six jointed, and very similar in detail, with the third joint longest, except in *K. ceriferus* and *K. pubescens*, where the sixth joint is a little the longest. For convenience, I give here the antennal formulars of those not included in the table below. *K. gillettei* (36)2(45); *K. boguei*, 36(21)45; *K. cockerelli*, 36(12)45; *K. nigropunctatus*, 36(45)2; *K. ceriferus* (63)(12)(45); and *K. austini*, 36(25)(41). The following tables of measurements are in micromillimeters.

ANTENNAL SEGMENTS OF THE NORTH EASTERN SPECIES.

Forms	1	2	3	4	5	6	Formula	Total length
Kermes galliformis	20	16	24	12	16	24	361(25)4	112
" pettiti	20	16	24	12	16	24	361(25)4	112
" pubescens	16	16	20	12	16	24	63(125)4	104
" nivalis	16	20	28	16	16	24	362(145)	121
" kingii	20	16	28	12	16	24	361(25)4	116
" andrei	20	16	24	12	16	24	(36)1(25)4	112
" perryi	16	12	24	12	16	20	36(15)(24)	100

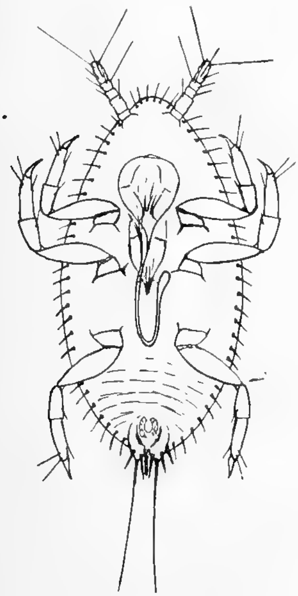
FRONT LEGS OF THE SAME SPECIES. LENGTH AND BREADTH.

Forms	Coxa	Femur with trochanter	Tibia	Tarsus	Claw
Kermes galliformis	20–36	80–24	36–20	52–16	16
" pettiti		72–28	32–20	60–16	20
" pubescens	32–36	72–24	32–24	40–16	12
" nivalis	24–36	72–24	26–20	52–16	16
" kingii	20–36	76–24	36–20	56–16	16
" andrei		60–28	28–20	40–16	16
" perryi	24–40	76–24	32–20	52–16	16

Other Characters.

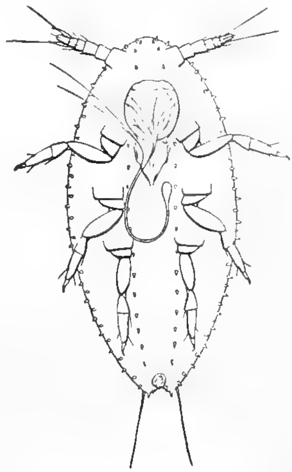
Forms	Color	Length	Breadth	Tubercle setae	Tubercle spines	Marginal spines
Kermes galliformis	Dark brown	480	260	212	24	12
" pettiti	French yellow	420	236	200	20	20
" pubescens	Same	420	192	132	12	8
" nivalis	Light yellow	360	200	76	20	12
" kingii	Reddish brown	360	168	180	24	16
" andrei	Dark yellow	360	160	120	28	28
" perryi	Same	412	240	120	16	12

Figures of *Kermes pubescens* and *K. kingii* are given to show the relative differences there are in the larva stages of the northeastern species at least, and so



Young larva of *K. kingii* Ckll.

far as described they represent all yet found in North America. *K. pubescens* seems to differ from all the other forms and resemble much the genus *Eriococcus*, especially so in the shape of its spines; it looks much like *Eriococcus eucalypti* Mask.; *pubescens* has six rows, while *eucalyptis* body is thickly covered, *pubescens* caudal tubercles are very small, very different from all other species. The figure of *K. kingii* represents in a general way all the other forms of our *Kermes* larvae. In shape all are oval or slightly elongate oval, differing somewhat in color and in the measurements of their antennal segments, legs, etc. It is quite clear, as Mr. Pergande pointed out to Prof. Cockerell, that the



Young larva of *K. pubescens* Boguei.

Kermes in their larval stages are really allied to the genus *Eriococcus*, but in the adult stage they superficially resemble *Lecanium*. Something has been said by me and others to the effect that some of the species appear to be viviparous or perhaps parthenogenetic, but there may be some doubt about this. We have not found any of the winged ♂ forms. I have, however, met with several just lately in the larvae stage, not so large as the young ♀ larvae, but was not successful in getting mounts of any.

Parasites. Prof. Bogue has found *K. pubescens* to be attached by a *Chalcid*, also Prof. Ehrhorn finds *K. cockerelli* attacked by a chalcid sp. The department of Entomology at Washington have the following species bred from *Kermes*: *Telenomus* sp., *Cosmocoma elegans*, *Blastobasis coccivorella*, and also a *Lepidopterous* inquiline *Euclemensia bassettella*. Species bred by me and determined by Dr. Howard and Mr. Ashmead are from *K. galliformis; Encyrtus* sp., *Cerchysius* ♀, two species of *Epiencyrtus* and a genus unknown to Mr. Ashmead. *Euclemensia bassettella*, is quite frequently found. From *K. pubescens*, *Microterys cincticornis* has been bred. The size of *Kermes* in many of the species is so variable that an approximate measurement only can be given, and all are found to infest different species of oaks in North America. The only species thus far doing any material damage to the trees are *K. galliformis*, *K. pettiti* and *K. pubescens*, which I really believe to be the most injurious species we have.

The following list gives all of our United States species of *Kermes*, together with the date of their discovery and publication. * indicates Massachusetts species.

	Forms	Discovered	Published	Published in
* 1	Kermes galliformis Riley		June, 1881	American Naturalist, vol. 15, 1881. P. 482
2	" gillettei Ckll.	Nov. 26, 1894	April, 1895	Entomologist, 1895, p. 101
3	" boguei Ckll.	Aug. 26, 1896	April, 1897	Entomological News, vol. 8, 1897. P. 94
* 4	" pubescens Bogne	Nov. 14, 1897	July, 1898	Can. Entomologist, vol. 30, 1898. P. 172
5	" concinnulus Ckll.	" " "	" "	" " " " " " "
6	" cockerelli Ehrh.	June, 1898	Oct., 1898	Entomological News, vol. 9, 1898. P. 185
7	" nigropunctatus Ehrh. & Ckll.	" "	" "	" " " " " " 189
* 8	" nivalis King & Ckll.	July 8, "	" "	Ann. & Mag. of Nat. Hist., ser. 7, vol. 2, Oct., 1898. P. 330.
* 9	" kingii Ckll.	" 28, "	" "	Ann. & Mag. of Nat. Hist., ser. 7, vol. 2, Oct., 1898. P. 330.
10	" ceriferus Ehrh.	"	Jan., 1899	Can. Entomologist, vol. 31, 1899. P. 5
*11	" pettiti Ehrh.	"	" "	" " " " " " 7
12	" austini Ehrh.	"	May, "	" " " " " " 10
*13	" andrei King	Sept. 9, 1899	Jan., 1900	PSYCHE, vol. 9, 1900. P. 22
*14	" perryi King	July 28, 1898	May, 1900	Herein described
15	" galliformis var cueroensis Ckll.	May 2, 1898	May, 1900	" "

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NOTES ON TWO CANADIAN BUTTERFLIES.

BY NAPIER N. DURAND, NORTH TORONTO, CANADA.

1. *Euphoeades troilus L.* It is stated in Scudder's "Everyday Butterflies" that this species is "double-brooded throughout its range." I, however, have not found this to be ordinarily the case in this neighborhood (Toronto). Until last summer (1899) I had for several years obtained considerable numbers of the larvae and reared them to chrysalis, but never but in one season do I remember the chrysalis to have given birth to the butterfly the same year, and this was in the unusually warm summer of 1898 when three or four females emerged, from the 10th to the 12th of August, the other pupae in this as in previous years failing to disclose their inmates until the following season.

2. *Eugonia j-album* Bsd. & Lec. On June 6th, 1899, about 15 young larvae of this species were found, ranged side by side on a leaf of white birch; they were not accompanied by a web and were all black in color. Most of them were easily reared to maturity, but were not critically observed till the last moult. In their last stage they were found to vary somewhat in appearance. Most of them were black or almost black, except underneath and thereabouts where they were green; they were also sprinkled with white atoms, and tawny in some places. Approaching maturity however they became tinted with green, and when quite mature were dark green, the white atoms also greenish. Others were green throughout the whole stage, sprinkled with greenish-white atoms, and with the sub-dorsal region reddish-tawny; the whole larva becoming paler and greener until the reddish almost wholly vanished and the larva became finally rather pale green.

I found the pupae also to vary considerably. Some being gray, tinted with green; others pale greenish-gray; others darker gray, without, or almost without green; others pale green, some of them salmon-tinted; others dull green and pinkish brown; while others again were wholly salmon-tinted and olive green. In all of these the middle tubercles were heavily and brilliantly silvered, especially in the paler colored pupae. One chrysalis found on June 23d, suspended from a milk-weed leaf was pale green, almost white, and slightly sprinkled with minute brown atoms, mostly upon the wing-covers, especially about their base.

It was interesting to observe that the green of the chrysalis, though paler, was very similar to the soft green of the underside of the milk-weed leaf, from which it was suspended.

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BY S. J. HUNTER AND W. S. SUTTON, KANSAS UNIVERSITY, LAWRENCE.

Femur-rubrum Series.

M. femur-rubrum DeGeer.— The specimens taken in Ford county vary from the description of Scudder in having the general ground color, fuscous, a noticeable yellowish tinge on the genae; and head rather heavily infuscated instead of olivaceo-plumbeus as Scudder described it, and as the forms in the eastern part of the State show. Hind femora not olivaceo-testaceous but rather flavo-testaceous, roseate below. Hind tibiae of one specimen bright red, other slightly tinged with red. End of abdomen not very strongly recurved in males. The cerci differ slightly from Scudder's figures, being broader at the base and more tapering in the basal half. Quite generally distributed over the State. Noticeably supplanted, however, in Douglas county within the last ten years by *M. atlanis*.

Cinereus Series.

M. bispinosus Scudder.— Of this we have but one male from Ford county, July. It answers Scudder's description with the following exceptions: Interspaces between mesosternal lobes hardly twice as long as broad; Scudder says "fully twice as long," prozona not quadrate but slightly elongate, anterior margin hardly "truncate," but broadly and shallowly notched mesially. In the length of the prozona it tends towards *M. terminalis*, a closely allied species, but in the characteristics of the male abdominal appendages it agrees perfectly with Scudder's description and figure of *M. bispinosus*. This is a species first described by Scudder in his Revision and reported only from Texas.

Packardii Series.

M. packardii Scudder. — Median carina sometimes but rarely marked on prozona by a fine sharp black line. Medio-dorsal stripe varies both in intensity of color and in breadth; in color from testaceous to dark fuscous, in breadth from one third to one half the width of the prozona. In the blue-legged variety the stripe is darker and more clearly defined than in those with red hind tibiae and shows a stronger tendency to taper to a point on the metazona. Sub-genital plate sub-equal, generally broader than long, rarely only as broad as long.

Ford county seven females, Hamilton county one male, Finney county three males and one female, Russell county two females and one male, July. Ten of these had blue hind tibiae and five red. They were common in the alfalfa fields of Ford and Edwards counties and were observed ovipositing in these fields September first.

Collinus Series.

M. minor Scudder.—Exceptions to description of Scudder: — prosternal spine strongly appressed (Scudder says "More or less") and strongly inclined caudad, head not very prominent, metazona very slightly expanded if at all; specimen had hind tibiae of pale glaucous color. Of supra-anal plate Scudder says, "triangular with acute-angulate apex, nearly flat, with narrowly moderately deep median sulcus between rather prominent ridges which are confluent apically, and terminate a little behind the middle of the plate." The specimen in hand would be perhaps better described as spherico-triangular and slightly elevated in the region of the median sulcus. In other respects conforming to the description.

One male, Ford county. Now first reported from Kansas.

Robustus Series.

M. differentialis Uhler.—Frontal costa generally equal, but rather frequently, slightly expanded at the ocellus, angle of hind margin of metazona decidedly more obtuse in the male. All the transverse sulci of the pronotum are deeply marked with fuscous on lateral lobes especially the middle sulcus. In the insects of this species in which the ground color is light or "yellowish testaceous" there is a strong tendency to marbling of the face and pronotum, with darker testaceous which is frequently localized in three quarters: first, as two diverging stripes upon the vertex, second as irregular clouds upon the face, third as spots principally on the disk of the pronotum whose outlines follow but do not coincide with those of the blackish fuscous of the sulci.

This is the most common native species in Kansas and at times occurs locally in such numbers as to cause considerable damage. It is quite partial to alfalfa and by reason of this early food plant it thrives in undue numbers in the vicinity of such fields. It occurs throughout the State wherever cultivated land is to be found. In the high plains of western Kansas it may be found in the vicinity of plowed lands or weeds growing upon the same, but never appears to venture far out on the plains away from this class of food. The black variety is not uncommon. Bruner speaks of this species as inhabiting low and moist places. Though locally destructive in the Arkansas valley we have observed it as equally active and numerous upon the high plains.

Bivitattus Series.

M. bivitattus Say.—This species occurs under the same conditions as *M. differentialis* but not in such great numbers. It matures about the middle of June in Edwards and Ford counties nearly two weeks before *M.*

differentialis passes through the last moult.

PHOETALIOTES.

P. nebrascencis Thos.— Four specimens from Ford county, two of each variety (*P. n. nebrascencis* and *P. n. volucris*). Structural characteristics conform well with the description, except that in three of the four cases the fastigium is plainly sulcate. The other specimen — *P. n. nebrascencis* corroborated the description of Scudder. Prosternal spine not "erect" but slightly recumbent. Extremity of male abdomen only feebly clavate.

In the short winged variety *P. n. nebrascencis*, the two specimens at hand show marked variation in tegmina; alike in width, they differ in length, and in the form of distal extremity. The specimens agree in size, but tegmina are six and nine mm. in length respectively. The shorter tegmina end more abruptly and the apex is more acute than in the longer wing.

Two males of each variety from Ford Co., July.

THE CLEAR-WINGED SPECIES OF THE OEDIPODINE GENUS MESTOBREGMA.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Most of the described species of the genus Mestobregma, like the type of the genus, have the wings distinctly crossed mesially by a fuscous band of greater or less width. In one species, however, *M. kiowa* Thom., the wings are pellucid, except for the fuscous veins and for the occasional faint clouding of the wings at the normal point for the band, or the heavier infuscation of the cross-veins in this region.

In the collections brought from the Pacific coast by Mr. A. P. Morse, are three species of the genus with wings showing at most no greater indication of a cross-band than in the species mentioned; indeed one of them is that species, which has never before been recorded from west of Utah. They were found in successively more southern regions. The broad-winged form, *M. kiowa*, was obtained only in northern California near Mt. Shasta. The narrow-winged species occurred, one, *M. hyalinum*, in the San Joachin valley from the latitude of San Francisco to that of Los Angeles, the other, *M. rosaceum*, from the southern edge of the San Joachin valley to Yuma, Arizona.

The species may be separated as follows: —

Table of the clear-winged species of Mestobregma.

a^1. Median carina of pronotum nearly obliterated between the sulci, here no more prominent than the lateral canthi of the scutellate disk beside it; process of metazona a little obtusangulate, rarely rectangulate; contrasted markings of tegmina confined to the costal field; wings relatively narrow, twice or more than twice as long as broad; hind tibiae yellow, occasionally faintly tinged with glaucous.

b^1. Front lobe of median carina of pronotum not prominent; lower posterior corner of lateral lobes distinctly angulate in female; wings pellucid, but with the basal half or less roseate, sometimes with feeble indications of a transverse band beyond by the broader infuscation of the cross-veins.

rosaceum.

b^2. Front lobe of median carina of pronotum distinctly cristate; lower posterior corner of lateral lobes well rounded in both sexes; wings wholly pellucid except for the apical infuscation of some of the anterior veins, with no signs of a transverse band.

hyalinum.

a^2. Median carina of pronotum crested between the sulci, here forming a distinctly rounded lobe; process of metazona rectangulate or subrectangulate; contrasted markings of tegmina crossing the discoidal as well as the costal field; wings relatively broad, distinctly less than twice as long as broad; hind tibiae blue. . . . *kiowa*.

Mestobregma rosaceum sp. nov.

Ferrugineo-testaceous, much marked with fuscous. Head salient, ferrugineo-testaceous, in the male paler than in the female and also often marked above with longitudinal fuscous stripes, and with a slender transverse line between the eyes, also found in the female; fastigium of vertex brief, deeply sulcate, particularly in the male, with a distinct median carina, the sharp margins of the fastigium continuous with the margins of the deeply sulcate frontal costa, which is narrow, slightly expanded at the ocellus, and broadens a little below; eyes prominent, particularly in the male; antennae a little (♂) or considerably (♀) shorter than the hind femora, testaceous annulate with fuscous or the reverse. Pronotum hardly longer than broad, mesially a little constricted, above of the color of the head, the lower portions of the lateral lobes clay-yellow, margined above with black fading into fuscous or ferruginous, the disk more or less (in the male conspicuously) marked with short longitudinal fuscous stripes, often with flavous interspaces; median carina no more elevated on the prozona than on the metazona or than the canthi of the scutellum, which is not at all pronounced; process of metazona a little obtusangulate; lower margin of lateral lobes with a distinct posterior depending denticulation in the female, the angle subrectangulate and rounded in the male. Tegmina very long and subequal, feebly maculate throughout, but with the contrasted markings not very marked and confined to the costal field, which is mostly fuscous with a pale cinereous spot just beyond the widest part; wings fully twice as long as broad, pellucid with fuscous veins and the basal half or less tinged with rosaceous, the costal margin infuscated beyond the middle, and sometimes the indications of a mesial cross-band in the deeper infuscation of the cross-veins. Hind femora cinereous marked with fuscous, and especially with two fuscous spots above, at and beyond the middle; hind tibiae pale yellow, occasionally a little embrowned, especially beneath.

Length of body, ♂, 16 mm., ♀, 25 mm.; antennae, ♂, 9 mm., ♀, 10 mm.; tegmina,

♂, 19.5 mm., ♀, 27 mm.; hind femora, ♂, 10 mm., ♀, 13 mm.

19 ♂, 11 ♀. Tehachapi, Cal., Aug. 2; Palm Springs, Cal., July 13; and Yuma, Ariz., July 7 (Morse).

Mestobregma hyalinum sp. nov.

Cinereo-testaceous, heavily marked with fuscous, occasionally wholly embrowned. Head salient, dull testaceous, more or less infuscated or punctate with fuscous above, especially in the female, and usually with a transverse fuscous line between the eyes; fastigium of vertex as in the last species and connected as there with the deeply sulcate frontal costa, which broadens gradually below the ocellus and is there frequently punctate with black on the margins; eyes prominent, especially in the male; antennae somewhat (♂) or considerably (♀) shorter than the hind femora, testaceous basally, becoming ferrugineo-fuscous apically with obscure annulations. Pronotum a little longer than broad, somewhat constricted mesially, ferrugineo-testaceous, more or less and irregularly blotched with fuscous, the lateral lobes marked as in the last species; median carina somewhat cristate on the foremost lobe, but otherwise not higher than on the metazona, the scutellum moderately pronounced, and the disk of the metazona with sharp but not high elevations, particularly in the female; process of metazona usually a little obtusangulate, but sometimes rectangulate; lower posterior angle of lateral lobes somewhat retroarcuate, well rounded, nowhere angulate in either sex. Tegmina moderately slender, especially in the male, the discoidal field free of markings, the costal area dark fuscous, with a pallid patch a little beyond its widest part; wings twice as long as broad, wholly pellucid except that the costal margin is infuscated beyond the middle and the veins and cross-veins in the apical region are somewhat heavily infuscated. Hind femora testaceous, apically infuscated and with a median and postmedian fuscous patch above; hind tibiae pale yellow with the slightest possible glaucous tinge, occasionally very faintly infuscated.

Length of body, ♂, 16 mm., ♀, 25 mm.; antennae, ♂, 8 mm., ♀, 9 mm.; tegmina, ♂, 17.5 mm., ♀, 22 mm.; hind femora, ♂, 10 mm., ♀, 12 mm.

24 ♂, 25 ♀. Lathrop, Cal., Aug. 17; Tulare, Cal., Aug. 5; Kern City, Cal., Aug. 4; and Lancaster, Cal., July 31, (Morse).

Mestobregma kiowa.

Oedipoda kiowa Thom., Ann. rep. U. S. geol. surv. terr., v, 461 (1872).

Psinidia kiowa Thom., Rep. U. S. geol. surv. w. 100 mer., v, 885 (1875).

Mestobregma kiowa Thom., Proc. Dav. acad. nat. sc., i, 256 (1876).

Psinidia (Trachyrachis) kiowa Sauss., Prodr. Oedip., 164 (1884).

Trachyrachis kiowa Sauss., Add. prodr. Oedip., 59, 168 (1888).

I have specimens before me from Sioux City, Iowa (Whitman), Nebraska (Dodge), Kansas (Uhler), Colorado, 7000′, (Morrison), Ft. Collins and vicinity, Col., July, Aug. (Baker), Morrison, Col., Aug. 9 (Scudder), Manitou, Col., Aug. 24–25 (Scudder), Pueblo, Col., Aug. 30–31 (Scudder), Canon City, Col. (Uhler), mountains of Larimer Co., Col., July 11 (Baker), Garland, Col., Aug. 28–29 (Scudder), Roan Mts., Col., Aug. 15–17 (Scudder), White River, Col., at Utah boundary, July 24–Aug. 13 (Scudder), Salt Lake

Valley, Aug. 1–4 (Scudder), Spring Lake Villa, Utah Co., Utah, Aug. 1–4 (Palmer), and Gazelle, Cal., Sept. 4 (Morse). Besides these states, it has been reported from the Yellowstone region (Bruner), Dakota (Thomas, Bruner), and Montana (Thomas).

Of the spread specimens I have seen, all from east of the continental divide, have the base of the wings as pellucid as the distal half; while in all from west of this line, the base of the wings is washed with pale citron.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Synchlora glaucaria Guen. The larva has been described (as *rubivora* Riley) by Riley, Saunders and French but not in much detail.

Egg. Elliptical, strongly flattened on two sides, the flat faces concave, sunken, the edges well marked but a little rounded; side view slightly wedge shaped, the broader end truncate roundly, elevated in its center so as to be almost quite round like the narrower end, and is so except for a slight annular flattening, noticeable from side view. Surface all finely hexagonally reticulate, the reticulations not strongly raised. Pale, slightly greenish yellow, shining. Size .6 × .5 × .3 mm. Later turns pale red.

Stage I. Head round, slightly bilobed, pale brown, mottled with paler, with short, white, glandular setae; width about .3 mm. Body cylindrical, smooth, tubercles rather large, especially iv, which is cylindrical and produced with a conical tip. Setae white; on abdomen short with flattened enlarged tips, except iii (of joint 5) and iv (joints 6 to 9) which is very long and has a bulbous tip. This seta is sticky and bears, on its base principally, the fragments which adhere to the larva. Subdorsal setae of thorax and joint 12 also prolonged, but much shorter than the long lateral ones. Dark brown-black mottled with ocherous, especially on joints 12 and 13, which look lighter; traces of a dark dorsal line.

Stage II. Head rounded, slightly bilobed, of the color of the body; width .4 mm. Body as before, the setae glandular but much shorter, iv still the longest and arising from a somewhat produced base. Color dull brown, a whitish ground speckled with brown. Skin granularly roughened. Larva rather short and thick. It becomes entirely covered with fragments of the flowers it feeds on, which adhere to the sticky setae.

Stage III. Head rounded bilobed, clypeus rather high; shagreened, setae obscure; luteous whitish, speckled with brown, heaviest near the suture and on the sides of the lobes; width .8 mm. Body thick and robust, dorsum slightly flattened; tubercles angularly elevated; setae small except iv, which is large and arises from an elongated tubercle. No marked lateral projections, the slight angular projections nearly alike for all the tubercles. Gray brown, densely frosted with white granules, an obscure, double, white dorsal line, divided by brown; traces of a white lateral band on the angular elevations posteriorly, on anal plate and anal feet. Tubercles pale, setae white. All the dorsum except thorax and joints 12–13 covered with fragments of flowers which adhere to the spiny base of the short stiff seta iii. Feet pale.

Stage IV. Head rounded, scarcely bilobed, lower than prothorax, whitish, dotted with black over the sides and in a double streak on the vertex; width about 1 mm. Body short and thick, angular from the elevations, but without processes. Tubercle i and ii are high white cones with short, stiffs setae but with no elevation of the body; iv is a larger cone with similar seta (i.e. iii of joint 5, iv of 6 to 9), the tubercle radiately spinose on its shaft and arising from a slight lateral elevation or swelling of the body; before and a little below it is a smaller smooth white cone bearing seta iii; v and vi remote, similar to iii; upper vii smaller, below iii subventrally; lower vii and viii are prominent on the edge of the venter. Spiracle on the dorsal aspect of the slight bulge that bears tubercle iv on joints 5 to 9. Tubercles of thorax and joints 12–13 smaller; on 12, i is absent, ii is large and sticky like iv of 9, iii is rudimentary. Blackish gray; ground color blackish brown, densely frosted with round flattened, white granules, the prominent tubercles white and an angular white marking in a double dorsal line, along the angular lateral outline and subventrally, most distinct on joints 12 and 13. Thoracic feet pale; plates large, but colored and sculptured like the body. All covered with fragments of petals, adhering to the sticky tubercles. The spicules on the sticky tubercles are short cylindrical rods with blunt tips. The larva hibernated in this stage. full grown apparently. Bred at Washington, D.C., from eggs obtained Sept. 21. Earlier broods will give the moth the same season.

Larvae fed on flowers of Aster.

NOTES ON THE NESTING OF ANTHIDIUM PAROSELAE CKLL.

I do not know how long this bee had been working before I discovered it, but to my knowledge it carried honey and pollen into its nest for two days. The nest was a small round hole bored in the hard sand. The bee brought very small loads of pollen, and would remain in its nest about 45 seconds each time; it took from three to five minutes for it to collect each load, and when it returned it would sail about its nest a short time before entering. Once during the absence of the Anthidium a specimen of *Sphecodes fortior* Ckll. entered the nest and stayed about half a minute, and then flew out very swiftly, as if it were afraid the Anthidium would return and do it some harm. I had noticed from the beginning that another bee (*Hoplopasites productus* var. *subruber* Ckll.) lingered around the nest, and would frequently go to the entrance and look in. After a while during the absence of the Anthidium, it took the liberty of going into the nest, but it did not stay long. After the Anthidium had finished provisioning her nest, she brought some wool from the stems of plants and filled up the entrance. When the bee had gone I dug up the nest and found that it had stored its provisions in wool, the same as that with which it had closed up the nest.

Minnie Newberry.

[The above observations, made by Miss Newberry, a student of the N. M. Agricultural College, are of interest, because nothing whatever has been reported heretofore regarding the nesting of any of the insects mentioned. It is perhaps unsafe to assert that the Sphecodes and Hoplopasites are parasitic in the nest of the Anthidium, but the facts point to such a conclusion. The observations were made at Mesilla Park at the end of May, and I am responsible for the identification of the insects.—*T. D. A. Cockerell.*]

LOCALITIES FOR WESTERN TRYXALINAE.

In recent papers I have given descriptions of Tryxalinae brought home from the Pacific coast by Mr. A. P. Morse and with them localities at which certain other described species were taken. — In the present note I add other localities for described Tryxalinae all from the collection of Mr. Morse.

Syrbula acuticornis Brun. Mesilla, N. Mex., July 1.

Syrbula admirabilis (Uhl.) Flatonia, Tex., June 25.

Bootettix argentatus Brun. Mesilla, N. Mex., July 1; Juarez, Mex., July 3; Yuma, Ariz., July 5; Indio, Cal., July 9; Palm Springs, Cal., July 12.

Mesochloa abortiva (Brun.) Flatonia, Tex., June 25.

Amphitornus ornatus McNeill. Mesilla, N. Mex., July 1; Cahon Pass, Cal., July 19; Pt. Loma, Cal., July 23; Los Angeles, Cal., July 25; Lancaster Cal., Aug. 1; Gazelle, Cal., Sept. 5; Ashland, Or., Sept. 7.

Alpha cinerea? (Brun.) Sierra Blanca, Tex., June 26; Mesilla, N. Mex., June 30; Cahon Pass, Cal., July 18.

Bruneria shastana (Scudd.) Mt. Shasta Cal , Sept. 2.

Psoloessa maculipennis Scudd. Alpine, Valentine and Sierra Blanca, Tex., June 26.

Ageneotettix deorum? (Scudd.) Mesilla, N. Mex., July 2

Ligurotettix coquillettii McNeill. Yuma, Ariz., July 5; Palm Springs, Cal., July 12; Lancaster, Cal., Aug. 1.

Samuel H. Scudder.

Occurrence of Myrmeleon immaculatum DeGeer in Maine. — My attention was called Aug. 29, 1897, by Prof. H. S. Pratt to a number of holes or pits of ant-lions near Brunswick, Maine, between the town and New Wharf, and visiting the spot I found them in abundance in a sunny exposure in a sand-bank sheltered by the projecting turf. There were over 75 holes in one place and 55 in another. The next year I observed that some were still living there, but not so many. Miss Hale of Sherbrook, Canada, took some of the larvae home with her and from one of them was fortunate enough to rear the imago. This she kindly presented to me and I find by comparison with the specimens in the Hagen collection of the Museum of Comparative Zoology, Cambridge, that it is the species named above.

Miss Hale kept the larvae through the winter, feeding them with Tineid larvae, flies and spiders. One began to spin its cocoon March 5, the operation being completed within a day. The imago emerged June 1st.

Heretofore the northernmost published locality for this species has been Salem, Mass. (See Emerton in Amer. Naturalist iv., p. 705, Figs. 159-162). Emerton's larva spun May 15, the imago emerging June 25, "a very hot day."

This species of ant-lion has a very wide range; the following are the localities under the specimens in the Cambridge Museum, for which I am indebted to Mr. S. Henshaw: Keene, N. H., Michigan, Washington, D. C., North Carolina, Texas, Colorado, Oregon, and California. — *A. S. Packard.*

PROCEEDINGS OF THE CLUB.

9 March, 1900. The 213th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair. Messrs. James A. Field and Carl Otto Zerrahn were elected to active membership.

Mr. S. H. Scudder said he was working on a new list of the Orthoptera of New England; ninety-five species have thus far been taken. He also made some comparisons of the orthopterous faunas of England and New England. Some discussions on distribution followed.

13 April, 1900. The 214th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair. Mr. A. P. Morse was chosen sectary pro tem.

Mr. S. H. Scudder said he had completed a new list of New England Orthoptera for publication in Psyche, extending to very nearly one hundred species. The list of 1862 contained seventy-eight species, and the names then used were now changed in about three quarters of the instances.

Mr. W. L. Tower said he had studied the development of the wings in Leptinotarsa (Doryphora) 10-lineata, Say. The elytra and hind wings arise in exactly the same way and at the same time, in the first larval stage. The ectoderm of the body wall thickens, and invaginates; then the dorsal part of the invagination becomes thickened and is evaginated as the fundament of the wing into the cavity of the first invagination, which now becomes a peripodal sac. The wings develop parallel throughout the larval life. The elytra do not begin to become modified until the pro-pupa stages are reached. The wings become external by the withdrawal of the peripodal sac.

In the second larval stage a transient tracheal system enters each wing, and in the third stage six principal tracheal trunks enter each wing. Just before pupation the venation of the wings, which is indicated by the trachea, are almost identical. In this beetle I regard the elytra as true wings and not as divergent specialized structures as Krügel (1899) claims them to be.

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PSYCHE.

A LIST OF THE ORTHOPTERA OF NEW ENGLAND.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In my "Materials for a monograph of the North American Orthoptera," published in 1862, I added to the title: "including a Catalogue of the known New England species." Seventy-eight species were thus included, against thirty-nine in the series given in Harris's Insects injurious to Vegetation published in the same year but which did not pretend to completeness. No subsequent enlarged list covering the whole ground has since been issued, for Fernald's Orthoptera of New England does not add a single species. Morse, however, has given us a list of the principal family, the Acridiidae.

The present list gives ninety-eight species and includes the names of all known to occur in any part of New England and their distribution and abundance therein, as far as yet known. Species which are accidental visitors or which have plainly been introduced by accident are prefixed by an asterisk; excepting only that those which have been long introduced and are now thoroughly established in New England are not distinguished in this way. The Gryllidae need revision.

I add at the end a list of the species recorded in 1862 and their corresponding names in the present list; three quarters of them have been changed. The prefixed figures refer to the pages of the original paper.

FORFICULIDAE.

**Forficula percheroni* Guér. Known in New England only by a specimen in the Harris collection, marked by him as taken May 30, presumably in the vicinity of Boston. Probably an accidental seaport importation from the West Indies or South America.

Labia minor (Linn.). Widely spread; it has been taken in every one of the states excepting Rhode Island; from eastern Massachusetts I have seen specimens from about Boston, Cambridge, Medford (Sanborn) and Beverly (Burgess). Fernald reports it at Amherst, Mass., flying to light.

BLATTIDAE.

Blattinae.

Ischnoptera pennsylvanica (De Geer). The only new England specimen I have seen was taken in Winthrop, Mass. I have specimens, however, from Montreal and it probably occurs in all the states excepting Maine and perhaps New Hampshire.

Ischnoptera uhleriana Sauss. (*Platamodes unicolor* Scudd.). A common species under old logs in woods. Mass., Conn. (Norton). In my Catalogue of U. S. Orthoptera, I overlooked the identity of *uhleriana* and *unicolor*. I have compared the types.

Blatta germanica Linn. Found everywhere in abundance, especially in dwellings in towns and cities.

Phyllodromia borealis (Sauss.). (*Ectobia flavocincta* Scudd.) Under objects lying on the ground in woods. Prout's Neck, Scarboro, Me.; about Boston, Mass. (Harris); Conn. (Norton). In my Catalogue of U. S. Orthoptera I accidentally omitted the synonymy given above; both descriptions appeared the same year, but months apart.

Nyctoborinae.

* *Nyctobora sericea* Burm. About Boston. Introduced from South America. A single example seen.

Periplanetinae.

* *Eurycotis sp.* A nymph of some species of this genus with the pronotum distinctly margined, except posteriorly, with yellow, — possibly *E. finschiana* (Sauss.) taken in Wellesley, Mass., on a bunch of bananas was sent me by Mr. A. P. Morse.

Stylopyga orientalis (Linn). Very common along the seaboard, especially in city dwellings; a cosmopolitan species.

Periplaneta americana (Linn). Common along the seaboard, especially in city dwellings and warehouses; a cosmopolitan species.

Panchlorinae.

* *Panchlora pocyi* Sauss. Occasionally occurs in seaboard cities, probably introduced in banana-bunches.

* *Pycnoscelus surinamensis* (Linn.). A single immature specimen of this tropical roach has been taken in central Massachusetts at Springfield.

Perisphaerinae.

* *Hormetica advena* Scudd. A single specimen, taken in Belmont, Mass., was doubtless introduced from tropical America, probably in banana-bunches.

PHASMIDAE.

Diapheromera femorata (Say). Very common on trees and bushes and especially on scrub-oak. I have never seen specimens from Maine, but it is found in all the other New England states.

ACRIDIIDAE.

Tettiginae.

Nomotettix cristatus (Scudd.). "Common locally over the larger part, at least, and probably occurs in the whole of the district. . . . . Found everywhere on light soils, but especially in dry pastures" (Morse)

Tettix granulatus (Kirby). "Found over probably the whole of New England. . . . Prefers sedgy meadow lands" (Morse).

Tettix ornatus (Say). Occurs throughout New England in localities like the last, but is not so common.

Paratettix cucullatus (Burm.). Occurs only in the southern part of New England, in Connecticut and rarely in Massachusetts. It seems to be found generally near water.

Tettigidea parvipennis (Harr.). Abundant throughout New England. Prefers "moist, grassy and sedgy meadows, particularly on rather light soil" (Morse).

Tryxalinae.

Orphulella pelidna (Burm.). Common in the three southern states, especially near the seaboard.

Orphulella speciosa (Scudd.). Very abundant throughout the district.

Orphulella olivacea (Morse). Known in New England only from southwestern Connecticut.

Dichromorpha viridis (Scudd.). "Found throughout Connecticut, in Rhode Island, and in central and southwestern Massachusetts" (Morse).

Chloealtis conspersa Harr. Throughout New England and not uncommon, near woodland.

Stenobothrus curtipennis (Harr.). Most abundant and thoroughly distributed, being everywhere one of the commonest species.

Mecostethus lineatus (Scudd.). "Rather common in southern New England in wet, sedgy meadows" (Morse). It has also been taken at elevated points in Massachusetts, such as Williamstown, and at Norway, Me.

Mecostethus gracilis (Scudd.). In northern and elevated parts of New England, from the summits of the White Mts. to the Berkshire Hills.

Mecostethus platypterus (Scudd.). Much the rarest species of the genus and so far only definitely known from New England, in Massachusetts and Connecticut.

Oedipodinae.

Arphia xanthoptera (Germ.) Found in the southern half of New England in no great abundance.

Arphia sulphurea (Fabr.). Common in pastures throughout New England.

Chortophaga viridifasciata (De Geer). Abundant everywhere.

Encoptolophus sordidus (Burm.). Very common throughout.

Camnula pellucida (Scudd.). Common, often excessively common in northern New England, especially on dry hillsides, but rarely occurring in the southern half of the district, though it has been taken in Connecticut.

Hippiscus rugosus (Scudd.). Occurs rarely in Maine (Norway) and eastern Massachusetts.

Hippiscus tuberculatus (Palis.). Found throughout New England, but never very common, apparently more abundant in the northern than in the southern portions.

Dissosteira carolina (Linn.).

Everywhere common, especially by roadsides, and so much in evidence.

Spharagemon collare (Scudd.). Common, but rather local, on dry uplands throughout all but the northernmost portions of New England.

Spharagemon saxatile Morse. Common on rocky hillsides in Massachusetts and Connecticut.

Spharagemon bolli Scudd. Common on barren ground throughout the greater part or all of New England, but not definitely recorded from the northermost portions.

Scirtetica marmorata (Harr.). Along southern seacoast, not very common.

Psinidia fenestralis (Serv.). "A common and widely distributed species, occurring nearly everywhere in sandy spots in southern New England, and probably throughout the entire district" (Morse). It has been taken as far north as Fryeburg, Me., and North Conway, N. H.

Trimerotropis maritima (Harr.). Common on the sands along the immediate seashore, from the southernmost corner of Maine southward.

Circotettix verruculatus (Kirby). Common on bare ledges in northern New England, rarely occurring so far south as Massachusetts, though it has even been reported from Canaan, Conn.

Acridiinae.

Pseudopomala brachyptera (Scudd.) Not uncommon locally . . . on waste lands. . . . It doubtless occurs in all of the New England States" (Morse), but has not yet been reported from Vermont, New Hampshire or Rhode Island.

Schistocerca rubiginosa (Harr.). The seacoast, from central Massachusetts southward; not uncommon.

Schistocerca alutacea (*Harr.*). Southern seaboard; not uncommon.

**Schistocerca americana* (Drury). An immigrant colony from the south settled on the seaboard in eastern Massachusetts some years ago, but seems now to have disappeared. The species will probably be found occasionally in southwestern Connecticut.

Hesperotettix brevipennis (Thom.). Eastern Massachusetts, not uncommon locally. It will doubtless be found in Connecticut, in suitable localities.

Podisma glacialis (Scudd.). Western Maine, northern New Hampshire at high elevations; Summit of Greylock, Mass.

Melanoplus atlanis (Riley). Abundant everywhere, sometimes destructive.

Melanoplus scudderi (Uhl.). Southern Massachusetts and Connecticut.

Melanoplus mancus (Smith). Elevated localities in Maine and New Hampshire. It is also reported from North Madison and Woodstock, Conn.

Melanoplus dawsoni (Scudd.). This is a western species found from Assiniboia to Nebraska; but it has occurred near Toronto, Canada, and a single specimen has been taken at Brunswick, Me. It may be looked for in northern New England.

Melanoplus fasciatus (Barnst.). Common throughout New England.

Melanoplus femur rubrum (De Geer). Exceedingly abundant everywhere.

Melanoplus extremus (Walk.). In the northern half of New England, reaching the summits of the highest mountains; common.

Melanoplus minor (Scudd.). Common throughout New England.

Melanoplus collinus (Scudd.). Common throughout New England, especially on hillsides.

Melanoplus femoratus (Burm.). Very common everywhere.

Melanoplus pucntulatus (Uhl.). Everywhere except in northermost portions, but local, being found in the vicinity of pine trees.

Paroxya floridana (Thom.). Not uncommon, locally, in the southern third of New England.

LOCUSTIDAE.

Phaneropterinae.

Scudderia texensis Sauss.-Pict. Not uncommon everywhere except in northernmost districts.

Scudderia pistillata Brunn. Common everywhere, though not yet reported from southernmost localities. It extends eastwardly to Nova Scotia, where it is the only species of the genus known.

Scudderia curvicauda (De Geer). Common throughout.

Scudderia furcata Brunn. Common everywhere.

Scudderia septentrionalis (Serv.). Rare and known only from Maine and Massachusetts.

Amblycorypha oblongifolia (De Geer.) Common in the southern half of New England.

Amblycorypha rotundifolia (Scudd.) Common in the southern half or more of the district.

Microcentrum laurifolium (Linn.) Massachusetts, rare.

Pseudophyllinae.

Cyrtophyllus perspicillatus (Linn.). Found in isolated colonies in Massachusetts and more generally, but still locally, in Connecticut.

Conocephalinae.

Conocephalus ensiger Harr. Common in all but the northernmost parts of New England.

Conocephalus robustus Scudd. Common along the southern shores of New England.

**Conocephalus triops* (Linn.). A southern species which has occurred accidentally in eastern Massachusetts and may perhaps be found in Connecticut.

Orchelimum agile (DeGeer). Common throughout New England.

Orchelimum herbaceum Serv. Found only on the southern borders.

Orchelimum glaberrimum (Burm.). Connecticut.

Xiphidium brevipenne Scudd. Everywhere very common.

Xiphidium fasciatum (DeGeer). Common everywhere.

Decticinae.

Atlanticus pachymerus (Burm.). Rare; reported only from Connecticut.

Atlanticus dorsalis (Burm.). Rare; reported only in a few instances, but from every state but Maine.

Stenopelmatinae.

Ceuthophilus terrestris Scudd. The northern half of New England to the highest summits of the mountains; not uncommon.

Ceuthophilus brevipes Scudd. Known only from Grand Manan, Me., but not uncommon there.

Ceuthophilus neglectus Scudd. A common species, doubtless occurring throughout New England, though not yet reported from Maine, Connecticut or Rhode Island.

Ceuthophilus maculatus (Say). Common throughout New England.

GRYLLIDAE.

GRYLLOTALPINAE.

Gryllotalpa borealis Burm. Known only from the southern half of New England, but it probably occurs also in the northern, as it has been taken on the island of Anticosti in the lower St. Lawrence.

Tridactylus terminalis Uhl. It has been taken only in Massachusetts and Connecticut.

Gryllinae.

Nemobius fasciatus (DeGeer). Common everywhere.

**Nemobius cubensis* Sauss. A single specimen, labelled as from Norway, Me., is in the Cambridge museum.

Nemobius carolinus Scudd. Taken at a number of different places in Maine, Massachusetts and Connecticut. It is not common in the North.

Gryllus abbreviatus Serv. Common everywhere.

Gryllus luctuosus Serv. Common everywhere, but especially in the north, where it has even been taken on the summit of Mt. Washington.

Gryllus pennsylvanicus Burm. Common in the southern half of New England.

Gryllus neglectus Scudd. Common in the southern half at least.

Gryllus domesticus Linn. I have seen no specimens from New England, but have been told that it occurs sparingly on our southern borders.

Oecanthinae.

Oecanthus bipunctatus (DeGeer). Has been taken at New Haven, Conn., by A. P. Morse.

Oecanthus niveus (DeGeer). Common throughout at least the southern half of New England.

Oecanthus pini Beut. Connecticut.

Note. — I have not studied the New England species of Oecanthus, but doubtless several other forms recognized outside its limits will be found within them.

Eneopterinae.

**Apithes agitator* Uhl. This southern species, ranging as far north as Maryland, has been found breeding in the greenhouses of the Botanic Garden at Cambridge, Mass.

Revision of the List of 1862.

Forficulidae.

415. Spongophora bipunctata = Forficula percheroni.

Labia minuta = Labia minor.

Blattidae.

416. Stylopyga orientalis = Same.

Periplaneta americana = Same.

417. Platamodes unicolor = Ischnoptera uhleriana.

418. Ectobia germanica = Blatta germanica.

Ectobia lithophila = Ischnoptera uhleriana.

419. Ectobia flavocincta = Phyllodromia borealis.

422. Pycnoscelus obscurus = Pycnoscelus surinamensis.

Phasmidae.

423. Diapheromera femorata = Same.

Acridiidae.

454. Opomala brachyptera = Pseudopomala brachyptera.

455. Chloealtis conspersa = Same.

Chloealtis viridis = Dichromorpha viridis.

Chloealtis punctulata = Dichromorpha viridis.

456. Stenobothrus curtipennis = Same.

Stenobothrus melanopleurus = Chloealtis conspersa.

457. Stenobothrus longipennis = Stenobothrus curtipennis.

458. Stenobothrus maculipennis = Orphulella pelidna.

459. Stenobothrus aequalis = Orphulella speciosa.

460. Stenobothrus bilineatus = Orphulella speciosa.

461. Stenobothrus propinquans = Orphulella pelidna.

Tragocephala infuscata = Chortophaga viridifasciata.

Tragocephala viridifasciata = Chortophaga viridifasciata.

462. Arcyptera lineata = Mecostethus lineatus.

463. Arcyptera platyptera = Mecostethus platypterus.

Arcyptera gracilis = Mecostethus gracilis.

464. Caloptenus femur rubrum = Melanoplus femur rubrum.

465. Caloptenus punctulatus = Melanoplus punctulatus.

Caloptenus bivittatus = Melanoplus femoratus.

466. Acridium alutaceum = Schistocerca alutacea.

467. Acridium rubiginosum = Schistocerca rubiginosa.

468. Oedipoda carolina = Dissosteira carolina.

Oedipoda phaenicoptera = Hippiscus tuberculatus.

469. Oedipoda rugosa = Hippiscus rugosus.

Oedipoda xanthoptera = Arphia xanthoptera.

470. Oedipoda sulphurea = Arphia sulphurea.

Oedipoda aequalis = Spharagemon collare.

471. Oedipoda verruculata = Circotettix verruculatus.

472. Oedipoda maritima = Trimerotropis maritima.

Oedipoda marmorata = Scirtetica marmorata.

Oedipoda eucerata = Psinidia fenestralis.

Oedipoda pellucida = Camnula pellucida.

473. Oedipoda sordida = Encoptolophus sordidus.

474. Tettix granulatus = Same.

Tettix ornatus = Same.

475. Tettix triangularis = Tettix ornatus.

Tettix cucullatus = Paratettix cucullatus.

477. Tettigidea lateralis = Tettigidea parvipennis.

Tettigidea polymorpha = Tettigidea parvipennis.

478. Batrachidea cristata = Nomotettix cristatus.

479. Batrachidea carinata = Nomotettix cristatus.

Locustidae.

434. Ceuthophilus maculatus = Same.

Ceuthophilus brevipes = Same.

444. Cyrtophyllus concavus = Cyrtophyllus perspicillatus.

Phylloptera oblongifolia = Amblycorypha oblongifolia.

445. Phylloptera rotundifolia = Amblycorypha rotundifolia.

447. Microcentrum affiliatum = Microcentrum laurifolium.

448. Phaneroptera curvicauda = Scudderia curvicauda.

449. Conocephalus ensiger = Same.

449. Conocephalus robustus = Same.

451. Xiphidium fasciatum = Same.

Xiphidium brevipenne = Same.

452. Orchelimum vulgare = Orchelimum agile.

Orchelimum concinnum = Orchelimum herbaceum.

453. Orchelimum glaberrimum = Same.

Thyreonotus pachymerus = Atlanticus pachymerus.

454. Thyreonotus dorsalis = Atlanticus dorsalis.

Gryllidae.

425. Tridactylus terminalis = Same.

426. Gryllotalpa borealis = Same.

Gryllotalpa longipennis = Gryllotalpa borealis.

427. Gryllus luctuosus = Same.

Gryllus abbreviatus = Same.

Gryllus angustus = Gryllus abbreviatus.

428. Gryllus neglectus = Same.

Gryllus niger = Gryllus pennsylvanicus.

430. Nemobius vittatus = Nemobius fasciatus.

Nemobius fasciatus = Same.

431. Oecanthus niveus = Same.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XIV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Eois suavata Hulst. — This species was described by Dr. Hulst from the moths bred from the larvae here described.

Egg. Elliptical, rounded, only slightly flattened, one end distinctly smaller, the other (micropylar) scarcely flattened, not at all truncate. Reticulations distinct, strongly raised and thick, uniform, roundly hexagonal, alike throughout except just at the micropyle where they become small and delicate; they are somewhat coarser over the rest of the large end. Delicate blue-green, only slightly shining. Size $.8 \times .6 \times .5$ mm. Later a few red specks appeared; still later the color became white with an irregular green mark on the side and indistinct red specks at the large end.

Stage I. Head flat before, round, a shallow notch on the vertex, the vertex and sides of equal width. White on face, banded around the vertex and sides with brown-black; mouth dark; width .3mm. Body moderately slender, the legless segments well drawn out, normal. White with seven broad, black, transverse bands as wide as the intervening white spaces. Joints 2 and 3 white, the cervical shield large, concolorous; joints 4 to 10 broadly black banded centrally, the bands incised and nearly interrupted by the subventral fold, that of joint 10 completely so. Edges of bands irregular, but not diffuse. Legs all white, the abdominal ones with dusky shields; anal plate white. Tubercles small, dark, the setae short, stiff with swollen tips. Segments finely annulate, as much as 20; incisure part of segments smaller than the central part. Six setae on cervical shield; ia and iia of thorax small, the rest normal, no subprimaries. On feeding, the white parts, except the thorax, become faintly greenish; the black bands pale a little and a darker patch appears anteriorly subdorsally between warts i and iii. Thorax in some a little tinted with salmon color. Still later the bands are pale slaty, a narrow brown addorsal streak appears and some brown flecks subdorsally and subventrally.

Stage II. Head white with a few black specks, the larger ones forming an arc from ocelli above apex of clypeus; rounded, not bilobed; width .5 mm. Body white, the food showing faintly green; posterior rims of joints 5 to 9 ocher yellow; a fine double blackish dorsal line, cut at the incisures, the ends bent in to form a series of dorsal parallelograms, the cuts only at the ocherous incisures; a series of black subdorsal spots, a small double one anteriorly and two larger single ones medially and posteriorly on the segments, the latter joined by a slaty shade into a somewhat dumbbell-shaped spot, the marks confused and contracted at the extremities. A similar subventral row, but smaller and the anterior spot obsolete; a medio-ventral line, double, widened a little in the centers of the segments. The ends, joints 2 to 4 and 10 to 13 and feet appear simply white, peppered with black. Later the ventral ground color is pale green, the dorsal pale blue.

Stage III. Head round, white with a few black dots, three on each side of clypeus, a curved row of four from behind ocelli to apex of lobe and a smaller pulverulent one on the posterior edge; width 9. to 1.0 mm. Body bluish white dorsally, pale green ventrally, the incisures of joints 5 to 10 with bright orange bands; marks black, finely streaked on the numerous (about 25) annulets, dorsal loops, subdorsal spots (the two posterior joined) and ventral spottings as before. Tubercles and setae black, obscure, the latter rudimentary; iv stigmatal posterior. There are slight orange blotches in the somewhat broadly pale stigmatal region. Ends with double dorsal and single lateral streaked lines.

Stage IV. No essential change. Head 1.4 mm., darker, the orange marks more extensive. Head rounded, bilobed, clypeus a little depressed; head erect, free from joint 2. Body pale greenish white in ground, but the markings predominant. Slender, uniform, cylindrical, the segments about 25-annulate, all the marks cut into patches by the annulets. Double dorsal, broad lateral and broad obscurely double subventral bands, broken into the loops and spots of the previous stages, but less distinctly, being more connected. Orange in the extended incisures and more or less of it also dorsally and laterally and even ventrally in spottings between the black marks. Cervical shield and plates without orange. Anal plate and legs more finely spotted. Tubercles small and with spiracles black. Setae obsolete.

Pupation in the ground. Food plant *Randia aculeata*. Larvae from Palm Beach, Florida, eggs Jan. 12, mature larva Feb. 17, though others lingered much later. Probably breeds continuously.

OCCURRENCE OF MACHILIS VARIABILIS IN MAINE. — It may be as well to note the occurrence of this Thysanuran in Maine. I was informed by Dr. H. S. Pratt that he had found several of them running over the rocks at Little Flying Point, Freeport, Maine, and from his account I have no doubt it is this insect. It has not before been recorded north of Salem, Mass. — *A. S. Packard.*

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

PSYCHE.

THE HABITS OF MYRMECOPHILA NEBRASCENSIS BRUNER.*

BY WILLIAM MORTON WHEELER, AUSTIN, TEXAS.

Among the many insects now known to live as guests in the nests of ants the diminutive crickets of the genus Myrmecophila are in several respects remarkable. First, they are cited as the only members of the great Orthopteran order that have come to live with the most social of the Hymenoptera †; second, the males of the species of Myrmecophila have long been all but unknown, and third, the nature of the relationship of these little Gryllids to their emmet hosts has not been determined up to the present time.

In the November number of PSYCHE for 1899, Mr. Scudder published a monograph of the known North American species of Myrmecophila. This will undoubtedly encourage further work on this interesting genus along taxonomic lines. In the present paper I wish to call attention to the peculiar habits of one of the species, *M. nebrascensis* Bruner, which is very common in the vicinity of Austin, Texas. Here it may be found in the nests of no less than five very different species of ants. It is most abundant in company with *Formica fusca*, var. *neorufibarbis* Mayr — sometimes as many as 20 or 30 individuals occurring in a single nest — less abundant in the nests of the Texan agricultural ant (*Pogonomyrmex barbatus* Sm.) — and rare in the nests of *Camponotus castaneus* Latr., the Ponerine *Pachycondyla harpax* Fab. and a species of Cremastogaster. Its true host in this vicinity is undoubtedly *F. fusca* var. *neorufibarbis*, which digs its galleries under stones on moderately moist hill-slopes in the shade of the cedars and live oaks. Since nests of all the different species of ants above mentioned may be found very near one another, it is probable that the crickets occasionally seen in the nests of Pachycondyla and Camponotus are vagrants that have invaded strange territory.

These data on the occurrence of *M. nebrascensis* are of some interest since they extend both the geographical and symbiotic range of the species. Hitherto, according to the data accumulated

*Contributions from the Zoological Laboratory of the University of Texas. No. 7. Director, W. M. Wheeler.

† This statement now requires qualification. In a forthcoming paper I shall describe another Orthopteran genus, represented by a diminutive cockroach, which lives as a myrmecophile in the fungus gardens of the leaf-cutting ant of Texas (*Atta fervens* Say).

by Mr. Scudder,* it was known to occur in Minnesota (Lugger), Nebraska (Bruner) and New Mexico (Cockerell). The addition of one of the Gulf states, in which no members of the genus had been found, carries the species to its southernmost boundary. Heretofore it has been taken only in the nests of *Formica exsectoides* Forel (in New Mexico) and with some ants which Bruner incorrectly referred to *F. rufa.* Pergande believes that it "equally frequents the colonies of *Formica puberula* Em., *Form. integroides* Em., *Form. rubiginosa* Em. and possibly other forms belonging to the great Rufa group." †

The males of the European species of Myrmecophila are so rare as to be almost unknown. Scudder says (loc. cit., p. 428): "Although two species of the genus are known in Europe, and one of them is not uncommon, Brunner von Wattenwyl says the male is unknown to him, Saussure has but once seen one, and this was destroyed before he could describe the genitalia, and Fischer of Freiburg has seen the males of one species only, and in his classical work refers to it only by the words: "lam. supraanalis mihi non rite visa." It is, however, figured in Cuvier's Regne Anim., Disc. ed. pl. 82, fig 2." Even Wasmann, who has devoted special study to the guests of ants, cites the medium sized individuals of the European *M. acervorum* as doubtfully belonging to the male sex.* In the United States, however, the males of Myrmecophila are not uncommon. Among forty specimens Scudder found sixteen males, and these represented all but one of the five North American species.

The males of *M. nebrascensis* are very common at Austin. They bear to the females, I should say, the ratio of about one to seven or eight. That the somewhat smaller individuals without ovipositors and with a large, apically cleft subgenital plate are really the males is shown in sections. During April and May the testes, in active spermatogenesis, together with a huge accessory gland consisting of a radiating tuft of tubules, fill out nearly the whole abdominal cavity of the insect. The gland must have some important function connected with reproduction but this could not be determined.

At this same period of the year the abdomen of the female Myrmecophila is found to contain a few very large elliptical white eggs, in form and size not unlike the eggs of the ants among which the crickets live. I have not been able to observe the insect in the act of ovipositing. She probably thrusts her eggs into the moist compact soil that forms the walls of the galleries of the ants' nest. The eggs must hatch about the first of June, as I have seen the young, about one fifth to one fourth grown by

*loc. cit. p. 427.

† Scudder, loc. cit. p. 428.

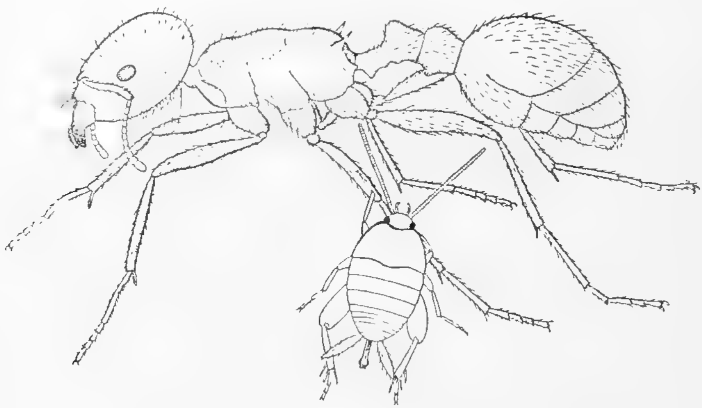
* Kritisches Verzeichniss der myrmekophilen und termitophilen Arthropoden. Berlin, 1894, p. 176.

June 22nd. They are paler and relatively somewhat narrower than the adults.

My observations on the habits of Myrmecophila began early in March of the present year. The little crickets were taken from the Formica nests and placed in artificial nests of Pogonomyrmex, an ant of slower movements and in many other respects more satisfactory for purposes of observation than the Formica. At first I used nests consisting of large-mouthed glass jars containing some earth in which the ants readily dug their galleries and chambers, sometimes next to the glass; but quite as often where their occupants could not be seen. The crickets placed on the earth at once crept down into the galleries and could be seen only from time to time moving about unmolested among the ants and along the walls of the burrows. This did not satisfy me, so I abandoned these earthen nests for cement nests of the Janet pattern. I had no occasion to regret this change as it enabled me to observe the insects for hours at a time without disturbing them, especially in the lamplight, of which both the ants and the crickets seem very fond. The following from my notebook is one of a number of similar observations.

April 3rd. Placed in the Pogonomyrmex nest twenty Myrmecophilas, eight or ten of which had been squeezed or had lost one or both saltatory legs during capture. All the disabled individuals were at once seized and dispatched in so vindictive a manner, that I could not doubt that the ants were irritated by the pungent *neorufibarbis* nest-odor still clinging to the crickets. In an instant all the ants in the compartment of the nest had gathered in little groups, each devouring a Myrmecophila. The uninjured crickets made not the slightest attempt to escape but felt themselves perfectly at home as soon as they set foot on the floor of the nest. Their adaptation to a new nest and to an ant of larger size and belonging to an entirely different subfamily from their former host, was immediate and complete. With constantly vibrating antennae they began dodging in and out among the little groups of assembled ants. From time to time one of them would be seen cautiously approaching an ant, that was busy with its dinner of Myrmecophila, and fall to nibbling at its legs or the tip of its abdomen. There could be no doubt that the cricket derived some benefit from the oily secretion covering the surface of the ant's body. At first the ant disregarded this nibbling, which probably resembles the attentions of the toilet habitually received from sister ants, but the cricket's scraping mandibles and maxillae soon grew annoying and the ant would either move away or turn its head, open its mandibles and make a lunge at the Myrmecophila like a large dog annoyed by a puppy. But before the huge mandibles had closed, the cricket was far away, already nibbling at the abdomen of some other ant. The cricket can get at only the legs and abdomen of its host, since the spreading legs prevent it from reaching the thorax. It often stands on its hind legs, as represented in the figure, and places its fore legs on the ant's leg, in order to reach the femur or tibia. For very obvious reasons, it avoids nibbling at or even approaching the ant's head. It is always alert, as if perpetually aware of danger and ready to dodge at the slightest movement made by the ant.

The crickets do not derive all their sustenance from cleansing their hosts. In earthen nests they are often seen haunting even the galleries that have been abandoned by the ants, scrutinizing the walls and nibbling at them from time to time. There can be no doubt that they find here the same substance which covers the ants, for the walls of the galleries of a populous nest soon be-



Myrmecophila in the act of feeding on the integumentary secretion of the agricultural ant.

come greasy from the attrition of the constantly passing ants. Sometimes the crickets may be seen nibbling at dead ants that have been temporarily abandoned in the galleries or placed on the kitchen-midden of the nest. The intestine of a Myrmecophila which I dissected was found to contain oil-globules and a granular whitish substance. It is possible that one or both of these may be the products of integumentary glands like those described by Janet.*

Occasionally in the narrow confines of an artificial nest the ants do succeed in capturing and devouring one of their vigilant little guests, but the fact, that of the eleven sound crickets left after the above observation was made, eight were still alive June 22nd, when I had to discontinue my observations for the summer, shows that the crickets are extremely expert in keeping out of danger. The attitude of the ants during all this time underwent no change so far as I could observe, for they would still occasionally make lunges at the crickets.

* Sur le Système glandulaire des Fourmis. Compt. Rend. hebd. de l' Acad. Sci. T. 118. p. 989, 1894.

It is an established fact that ants when moving to a new nest will take with them certain of their guests like their Aphides, and the singular beetles of the genera Claviger, Paussus, etc. Myrmecophila can lay claim to no such consideration. When a colony of *Formica neorufibarbis* moves, the crickets are all left behind. The heavy floods of the past spring gave me an excellent opportunity to convince myself of the truth of this statement. Many of the *neorufibarbis* nests which I was in the habit of visiting, were submerged during the night by a rapid rise of one of the creeks near Austin. The following day, when the water had subsided, I found that the nests had been completely deserted by the ants, but nearly all of them still contained numerous Myrmecophila wandering in and out of the galleries under the stones as if nothing had happened. I have also seen the crickets left behind in other *neorufibarbis* nests which were on higher ground and had been deserted for reasons unknown to me. These observations may explain a note quoted by Mr. Scudder concerning *M. oregonensis* Bruner. Dr. Fletcher informed him that this species is "common in British Columbia under almost every slab of wood in some places, whether there are ants there or not." I doubt the occurrence of Myrmecophila outside of ants' nests.

It is evident from the facts above recorded that the ants would gladly forego the company of their little nest-mates, but unless they resort to moving the whole colony, they are compelled to tolerate them for a very simple reason. The ants with their long bodies, incapable of much lateral flexure, always walk or run in long, straight or sinuous paths, and are quite unable to turn sharply about, whereas the short-bodied crickets move in a complicated zig-zag path made up of very short lines and abrupt angles. This seems to be the key to the symbiosis of the two insects: the ant and the cricket manage to get on together in the limited space of an ants' nest because they have very different, and, as it were, interdigitating modes of progression. Since the ants are quite able to clean themselves and one another and even take delight and spend much time in this employment, they probably derive little or no advantage from their cricket guests. The crickets, however, cannot get on without the ants and the greasy walls of their burrows. The symbiosis is therefore of a unilateral type and would seem to belong in the category of relationships called "Metoekie" or "Synoekie" by Wasmann. It is, in fact, a relationship but slightly in advance of that of the Collembolan *Cyphodeira* (*Beckia*) *albinos* Nic. which appears to obtain its entire sustenance from the walls of the ants' burrows without extending its attentions to the integument of the ants.

University of Texas,
Austin, Tex., June 22nd, 1900.

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* Die Myrmekophilen und Termitophilen. Compt. Rend. des Séances du 3me Congr. internat. Zool. Leyde 16–21 Sept. 1895. Leyden. 1896. p. 412.

THE DISTRIBUTION OF LEPTYSMA MARGINICOLLIS (SERV.).

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

A single mature and one or two immature specimens of a Leptysma taken July 13 by Mr. A. P. Morse at Palm Springs in Southern California (on bunch grass in Palm Cañon), and a single specimen from the Colorado Desert, Aug. 13, sent me by the Stanford University, had the pale lateral stripe so faint and were found so far west of the regions from which our only known species, *L. marginicollis* (Serv.), had been reported, that I at first thought I had an undescribed species before me. Comparison, however, showed that there was no other mark of distinction and this mark was absent from several other specimens I found in my collection, collected by Crotch about San Diego, Cal., that is, in the same or adjoining counties. This greatly extends the published distribution of the species. In my recent Catalogue I gave this as the "Southern States east of Mississippi." If I had gone over my collection carefully, I should have found specimens from the above localities and also from northeast Fla., Feb. (Maynard), Ft. Reed, Fla., April (Comstock) Appalachicola, Fla. (Thaxter), Georgia (Morrison), North Carolina (Shute), Smithville, N. C., Nov. 22 (Maynard), Vigo Co., Ind. (Blatchley), Auburn, Ala. (Baker), Houston, Tex., on water plants Belfrage), Dallas, Tex., March 6 (Boll), Kansas (Uhler), and Nebraska (Miss Walker). Bruner does not give it in his list of Nebraska insects. It has also been reported from South Carolina (Stål) and Tennessee (De Haan), and I have received it from Biscayne Bay Fla. (Slosson). The range should therefore have been stated as Southern States from Atlantic to Pacific.

MISCELLANEOUS NOTES ON COCCIDAE FROM WESTERN MASSACHUSETTS.

BY GEO. B. KING, LAWRENCE, MASS.

All of the Coccids cited below were collected in the vicinity of Springfield, Mass. (Hampden County), by Dr. George Dimmock, who sent them to me for study, and the following records add considerably to our already large list, and many new food plants are here listed for the first time.

(1) *Lecanium quercitronis* Fitch. Several lots of this have been received,

infesting various species of oaks, and one lot from *Ulmus americana*; this was also infested with *Chionaspis americana* Johnson. *L. quercitronis* is new to Mass.

(2) *Lecanium lauri* Boisd. on *Laurus nobilis*, new to Mass., on a plant in the Springfield Natural History Museum.

(3) *Lecanium tulipiferae* Cook on *Liriodendron tulipifera*, new to Mass.; this is probably *L. liriodendri* Gmel., 1788. Although his description is very poor, Prof. Cook's is not very much better and the insect should be redescribed.

(4) *Lecanium canadense* Ckll. was received on elm twigs.

(5) *Lecanium cockerelli* Hunter was found on Populus sp.

(6) *Lecanium armeniacum* Craw. on black cherry (*Prunus serotina*). I find the same individual variation of the antennal segments as did Mr. Hunter in his Kansas specimens; it is new to Mass. Dr. Dimmock informs me that the dates of hatching were from 26 June to 8 July, 1898.

(7) *Lecanium quercifex* Fitch on various species of oak twigs, and *Rhus glabra* a new food plant, and a very common species.

(8) *Lecanium corylifex* Fitch. on *Corylus americana.*

(9) *Lecanium antennatum* Sign. on black oak; only two examples of this were found, but Prof. Cockerell's notes are so clear on this species, that there is no doubt as to the identity of the species sent me; it is new to Mass.

(10) A species very much like *Lecanium bituberculatum* Sign. new to Mass., and needing further study, was found on oak.

(11) *Lecanium hemisphaericum* Targ. on *Cycas revoluta* in the Springfield natural history museum.

(12) *Pulvinaria innumerabilis* Rathv. on *Quercus ilicifolia*, *Euonymus americana*, and *Viburnum dentatum.*

(13) *Pulvinaria maclurae* Kenn. in Fitch on *Ampelopsis quinquefolia*, a new food plant.

(14) *Pulvinaria acericola* W. and R. on sugar maple in deep woods, new to Mass.

(15) *Kermes kingii* Ckll. one example on oak.

(16) *Dactylopius longispinus* Targ. on *Cycas revoluta* in the Springfield natural history museum.

(17) *Chionaspis americana* Johnson on *Ulmus americana* with *L. quercitronis.*

(18) *Chionaspis ortholobis* Comst. on *Populus grandidentata*; this seems to be quite common at Springfield as I have received several lots.

(19) *Chionaspis furfurus* Fitch on *Amelanchier canadensis*, *Populus grandidentata* and apple; *P. grandidentata* is a new food plant.

(20) *Chionaspis pinifoliae* Fitch on Pinus sp.

(21) *Mytilaspis ulmi* L.; this is very common on ash (*Fraxinus americana*) *Acer rubrum*, willow, *Populus tremuloides*, *P. grandidentata*, red root or New Jersey tea plant (*Ceanothus americanus*) *Sassafras officinale*, and Ohio buckeye (*Aescu-*

lus glabra); the last four are new food plants. *Mytilaspis ulmi* L. (Syn. *M. pomorum* Bouché) has now been recorded throughout the world from 46 different food plants. I have it from 22 in Mass. *Chionaspis furfurus* Fitch is found on 14 different food plants in Mass.

(22) *Aulacaspis elegans* Leon, on *Cycas revoluta*; this together with *Lecanium hemisphaericum* Targ. and *Dactylopim longispinus*, were on the same plant in the Springfield natural history museum. Previously recorded Coccids found at Springfield are *Gossyparia ulmi*, *Phenacoccus aceris*, *Ripersia kingii*, *Lecanium nigrofasciatum* and *Mytilaspis ulmi*.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Racheospila saltusaria Hulst.

Egg (dissected from moth). Elliptical-strongly flattened above and below, but rounded, one end depressed from side view; shagreened, scarcely reticulate; size .6 × .5 × .3 mm. Color, orange red.

Stage I. Head round, slightly bilobed, pale brownish; width .25 mm. Joint 2 high, collared in front, the collar notched centrally; otherwise cylindrical, smooth, slender, the segments bent angularly when walking; pale yellowish, shining; feet normal, short. Skin rather sparsely minutely granular. No tubercles or setae except on the anal feet and a pair on anal plate, pale, slightly enlarged at tips. Anal plate long, pointed behind, round before with two conical, thick, subanal prongs, approximate and longer than the plate.

Stage II. Head rounded, the lobes bluntly highly produced, a wide notch between; yellowish, sutures and mouth brown, ocelli black; width .33 mm. Body cylindrical, joint 2 with two high cones in front; anal plate long, rounded, the thick subanal prongs projecting beyond. Greenish yellow, smooth, no marks, minutely frosted. Later an interrupted dorsal brown line appears.

Stage III. Head lobes sharply conically produced; green, shaded with brown over the sides; width .55 mm. A high double point on joint 2; anal plate elliptical, pointed, the thick subanal prongs reddish. All else smooth, subgranular frosted, green, a brown dorsal line represented by dashes in the incisures.

Stage IV. Head flat before, the lobes produced into thick conical horns, slightly constricted centrally; clypeus rather high; dark brown, face frosted with whitish, and with frosted streaks over the lobes especially behind; mouth black brown; width 1 mm. Body slender, uniform, a large single green hump on joint 2 with two approximate, dark brown horns on the summit, a little recurved outwardly. Anal plate long, pointed behind, excavate before; shields of anal feet large, triangular, excavate below posteriorly. Feet of joint 10 small, approximate to the anal ones. Body stiff, angular when walking, dark green, very faintly frosted with white granules posteriorly; a series of dark vinous-brown intersegmental dashes, frosty edged, connected by a darker green stripe; on joints 10 to 12 these are contracted to a continuous line. Anal plate green; thick prongs vinous, white dusted. Thoracic feet brown. No tubercles or setae. Spiracles minute, brown. Central segments long drawn out, the ends contracted.

Stage V. Head lobes produced into high cones as before but each with a blunt low protuberance before and a little inwardly; mossy granular, minutely mottled white, brown and black, finely, pulverulently; width 1.7 mm. Thoracic feet colored like head, short, held close to it. Joint 2 horned with two bark gray points at the tip. A low double blackish lump below the spiracle of joint 6 corresponding to tubercles iv and v, varying in development in different specimens. Ends much contracted, the central part long drawn out, slender. Feet short; anal plate pointed cordate; anal leg shields trilobate. Leaf green, minutely white frosted with dense granules, part of them green; a series of small dorsal intersegmental black-vinous streaks with whitish frosted edges. Tubercles indicated by dark spots, themselves obsolete. Joints 10 to 13 gray and brownish shaded; a dark patch before the foot of joint 10; venter pale. The larva is a remarkable mimic of the young twigs of its food plant, *Condalia ferrea*.

Cocoon an imperfect net of threads between leaves. Pupa light brown with darker cases and a broken dorsal line. Larvae from Palm Beach, Florida; stage I found Feb. 26th, mature larva May 15th, the growth very slow for a subtropical insect. Probably breeds continuously, though much time is spent in the larval stage. Stage IV in one example lasted four weeks.

NEW ENGLAND ORTHOPTERA.

Mr. Samuel Henshaw sends the following additions (species or localities) to the List of New England Orthoptera published in the September PSYCHE.

Labia burgessi Boston, Mass.
Ischnoptera pennsylvanica Rhode Island.
Nyctobora sericea Springfield, Mass.
Periplaneta australasiae Wellesley, Mass.
Stagmomantis carolina Rhode Island.
Atlanticus pachymerus Brookline, Mass.
Oecanthus quadripunctatus Cambridge, Blue Hill, and Nantucket, Mass.
Oecanthus nigricornis Jaffrey, N. H., Cambridge and Blue Hill, Mass.
Oecanthus angustipennis Cambridge, Mass.
Oecanthus pini Gloucester, Mass.
Gryllotalpa borealis Vt.

MANTIS RELIGIOSA IN AMERICA.

Prof. M. V. Slingerland has just sent me for determination a female specimen of this insect, reared at Ithaca from eggs received from Rochester, N. Y., where, according to him, "the insect has established itself." It is the first time it has been reported in the New World so far as I know. It occurs in southern Europe and in Asia as far as Hindustan and Java and in Africa as far south as Zanzibar. *S. H. Scudder.*

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SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO. — I.

From Aug. 1 to 4 of the present year my wife and I had an opportunity to collect the almost unknown fauna and flora of the Hudsonian Zone in New Mexico. The locality visited was the summit of the range between the Pecos and Sapello rivers, near the headwaters of the Pecos. This is the main divide between the Rio Grande and Mississippi river systems, and has an elevation of about 11,000 ft. The sides of the range, from about 8000 ft. upwards, possess a very uniform fauna and flora, belonging to the Canadian Zone. When we arrive at the summit however we find a tableland of moderate width, inhabited by a very different set of organisms. The plants have the low stature and large flowers so characteristic of alpines, the bees are nearly all *Bombus* and among the butterflies we see *Parnassius*, *Brenthis* and *Colias scudderi*.

The plants and mollusca will be reported on elsewhere, but the insects and arachnids will all be enumerated in the following pages, the several groups having been kindly worked up by those who are most familiar with them. When the series of articles has been completed, it may be possible to add some comments of a general nature.

T. D. A. Cockerell.

ARACHNIDA.

BY NATHAN BANKS.

Araneida.

Pardosa glacialis Thorell. One female. Known from boreal and subboreal regions.

Xysticus gulosus Keys. One young specimen. Known from a large part of our country.

Dictyna sp. One female.

Erigone sp. One female.

Prosthesima sp. Several young specimens; near, and possibly identical with, *P. blanda* Bks.

Phalangida.

Homolophus biceps Thorell. Five specimens; previously known from Colorado, Wyoming, and Montana.

NEUROPTERA.

BY NATHAN BANKS.

Perlidae.

Nemoura sp. One specimen, closely related to the Eastern *N. albidipennis* Walk.

Trichoptera.

Limnophilus cockerelli n. sp.

Head yellowish; face with much yellow and some long black hair, vertex with long yellow bristles; antennæ yellowish, feebly annulate with brown, basal joint long, brown on its outer side; thorax yellowish, with yellow hair and bristles; abdomen brown, yellowish at apex; legs light yellow, tips of tarsi more red-brown, on the lower outer side of each anterior femur is a short rather indistinct brown line; spines black, numerous and rather short; spurs yellowish, 2-3-4, not long. Wings of moderate length and width, not prominently truncate at the tips; nearly uniform dirty yellowish, surface with fine yellow hair, veins and margins with black bristles; veins in middle part of wing mostly brown, often interrupted with pale, other veins pale yellowish; costal region unmarked, pterostigma concolorous with rest of wing; discal cell is no longer than its pedicel; hind wings hyaline.

Length, 10–12 mm.

Two specimens from top of range between Sapello and Pecos River, N. Mex., 2 Aug., altitude about 11,000 ft. In general appearances this species is similar to a pale *L. sitchensis* Kol., but distinct by unmarked pterostigma, shorter discal cell, mark on basal joint of antenna, and line on fore femur.*

* It will be observed that we have Limnophilus in Trichoptera, while Mr. Coquillett, in a later section describes a species of Limnophila in Diptera. These names may be considered sufficiently distinct, but if not so considered, the genus of Diptera has priority. The Trichopterous Limnophilus is also antedated by Limnophilus Fitz., in Reptilia, according to the dates given in the Nomenclator Zoologicus; but Hagen credits Limnophilus to Leach, which would throw it before Fitzinger's name. Banks (Tr. Am. Ent. Soc., XIX, 363) writes Limnephilus Leach, and this appears also in the Nom. Zool., with the date 1817, which is anterior to Macquart's Limnophila in Diptera. It would seem better to avoid confusion, to keep the original spelling of Limnephilus' Leach, and drop Limnophilus (Burm., 1869) as a homonym.—T. D. A C.

ORTHOPTERA.

BY SAMUEL H. SCUDDER.

The Orthoptera are all Acridiidae and all northern types.

Camnula pellucida Scudd.

A widespread species extending, next the Canadian border, from Atlantic to Pacific. It is found throughout the Rocky Mt. region and has even been taken as far south as Yuma, Arizona, by Morse.

Circotettix undulatus (Thom.).

This has not before been reported from so far south, but I have taken it in southern Colorado, including the sides of Sierra Blanca, just below timber line, or 11–12000′. It is found at points above 7500′ throughout Colorado, as well as in Nebraska, Utah, Wyoming, Montana and Nevada and is reported from Washington and Vancouver Island.

Melanoplus cockerelli sp. nov.

Closely related to *M. dawsoni* Scudd., from which it differs principally in the longer furcula, the much broader male cerci and the subgenital plate apically more elevated, and distinctly though minutely emarginate. The coloring is much as in that species. The interspace between the mesosternal lobes is about half as long again as broad (♂) or scarcely longer than broad (♀). The tegmina overlap and are considerably longer than the pronotum and a little longer than in *M. dawsoni*. The hind femora are stout in the male, red beneath, mostly fuscous externally, with oblique dashes of testaceous basally and the superior carina testaceous; much slenderer in the female and more obscure; hind tibiae deep red, becoming apically infuscated in the female. End of male abdomen upcurved and a little clavate, the supraanal plate moderate, triangular, mesially constricted, the median sulcus shallow with coarse walls; furcula consisting of a pair of blunt parallel spines about a third as long as the supraanal plate; cerci laminate, feebly falciform, about twice as long as basal width, feebly narrowing, well rounded apically, scarcely incurved; subgenital plate rather small, subpyramidal, elevated a little apically and slightly emarginate.

Length of body, ♂, 19 mm., ♀, 22 mm.; hind femora ♂, 11 mm., ♀, 12.25 mm.

Described from 1 ♂, 1 ♀.

Melanoplus altitudinum Scudd.

This species was taken by Lt. Carpenter on Taos Peak in the Sangre de Cristo Mts., N. Mex., at 13000, and occurs at high elevations (7–13000′) in the Rocky Mts. as far at least as Montana and Dakota.

Melanoplus sapellanus sp. nov.

In general coloring and markings hardly distinguishable from *M. altitudinum* Scudd., with which it agrees somewhat closely in structure, though not so closely as with *M. rusticus* Stål. The interspace between the mesosternal lobes is quadrate (♂) or a little transverse (♀). The tegmina overlap and are only a little longer than the pronotum. The hind femora are moderately stout in both sexes, red beneath, the outer face almost wholly blackish fuscous, but elsewhere testaceous; hind tibiae red. End of male abdomen hardly clavate or upturned, the supraanal plate rather small, triangular, rounded-tectate, with very slight median sulcus extending as far as a slight transverse median ridge; furcula consisting of a pair of parallel somewhat flattened dentations, about a third as long as the supraanal plate; cerci very small, not greatly compressed, blunt tipped, gently tapering and slightly curved, reaching but little beyond the transverse ridge of the supraanal plate; subgenital plate rather large, narrower than long, haustrate, with straight lateral margins, and well rounded apical margin, in no way elevated.

Length of body, ♂, 23 mm., ♀, 22.5 mm.; hind femora, ♂, 10 mm., ♀, 12 mm.

Described from 1 ♂, 3 ♀.

LEPIDOPTERA NOCTUIDAE.

BY J. B. SMITH.

Feltia vancouverensis Grt.

1 ♀. A common species throughout the mountains of the west — extending north into British America.

Carneades ochrogaster Gn.

2 females; throughout the Rocky Mountain region, north into British America; northern New York and New England; Ontario.

Orthodes virgula Grt.

Rocky Mountain region, not so common.

Plusia celsa Hy. Edw.

1 ♀. Described from "S. W. Ariz." Not a common thing. Closely related to my *angulidens* from the high Rockies.

Plusia hochenwarthi Hoch.

2 ♀. Not rare throughout the higher Rockies, and in the foothills in British America.

Melicleptria villosa Grt.

1 ♀. Common in the Colorado Rockies.

Drasteria erechtea Cramer.

1 ♀. Common everywhere.

NOTES ON THE SPECIES OF MACROPSIS AND AGALLIA OF NORTH AMERICA.

BY E. D. BALL, FORT COLLINS, COLO.

In 1898 Osborn and Ball published a review of the species of Agallia* in which thirteen species were included. A few months later Mr. C. F. Baker in a paper on the genus † described six species and one variety as new. Of these, five are synonyms of species included in our synopsis, leaving two to add to the list. The present paper adds three more, making eighteen strictly N. A. species, to which might be added five species by Uhler from St. Vincent Isd. though not strictly within our territory.

Agallia modesta O. & B.

Agallia mexicana Baker. Baker's specimens were from the same locality (Vera Cruz) from which *modesta* was described, and agree in every respect, except that he gives the last ventral segment of the ♀ as "slightly concave."

If he had followed his own elaborate directions for viewing this segment (Ent. News Mch. '99, p. 91–92) he would have found it truncate as originally described. In his remarks after the description 4-*notata* (used twice) should read 4-*punctata* and "this" in the last sentence should certainly be "these" instead.

Agallia producta O. & B.

Agallia heydei Baker. This species of Baker's was also described from the same locality from which the corresponding one of ours came. A comparison of the descriptions will satisfy anyone of their identity. In his description of the female segment he says "to a shallowly notched apex." The original description reads "truncate but often angularly elevated, giving the appearance of a slight median notch." Did he follow his own directions that time? The name 4-*notata* occurs three times in this description; there has been no species described under that name. He must certainly mean 4-*punctata* Prov.

* A review of the N. A. Species of Agallia. Proc. Dav. acad. VII, pp. 45–64. Authors Separata mailed Jan. 26, 1898.

† Psyche, April, 1898.

Agallia tenella O. & B.

Agallia producta Baker. The very distinct genitalia of the ♀ will at once distinguish this species. Both were described from Vera Cruz, probably from the same locality. The name *producta* could not stand in any case as it is preoccupied by the preceding species. Baker failed to mention how many specimens the description was based upon, a very important point, both with regard to the accuracy of the determination and the amount of variation to be allowed for. In this case, that he possessed one specimen of each sex, may be told by the description, but in his *anomala* the same omission exists, and the female alone is described, probably from a single example, the only distinctive feature being genitalia that might easily be the result of accident or imperfect development.

Agallia oculata V. D.

Male genitalia: — plates longer and narrower than in *tenella*, slightly, laterally emarginate at the base and enclosed by the swollen pygofers, the long, bluntly-rounded, upturned tips pressed so closely together that the suture is scarcely visible.

The male genitalia were not described in our synopsis of the group for lack of material. *A. oculata* is now known from Calif. and Mexico City, Mex.

Agallia reticulata n. sp.

Form of *novella* — but much smaller; tawny olive with ivory white markings and reticulations. Length 3 mm.; width 1 mm.

Vertex and face pale creamy yellow, a line on vertex just inside either eye, an oblique dash on either side the white apex, sometimes curving outward on the posterior margin, black; the ocelli, a pair of spots above them, a median line sometimes abbreviated to a third spot in line with the other two, a spot above each antennal pit and the lateral margins of the front, tawny orange. Pronotum tawny olive, the posterior margin narrowly light, lateral margin broadly so, a finger-like light process running from the humeral angle towards the inner corner of the eye, a broad median light stripe running forward from the posterior margin and triangularly widening on the disc and then truncately narrowing, continued as a round spot, the entire stripe divided by a slender tawny stripe, the margins of the white stripe sometimes narrowly lined with fuscous. Elytra tawny olive, the veins and numerous vein-like reticulations broadly white in strong contrast.

Genitalia; ultimate ventral segment of ♀ long, with a distinct median carina, the posterior margin in two evenly rounded lobes; male valve short, truncate, plates small, triangular.

Described from twelve specimens from Hayti (Crew) taken in Jan. and Feb. This species may be readily known by the reticulate veined elytra.

Agallia clitellaria n. sp.

Form of *novella* but much smaller, smaller than *reticulata*, narrow wedge-shaped. Black with light testaceous markings on head and pronotum and a lemon yellow saddle on the elytra. Length 2.5 mm.

Vertex and face black, a large pentagonal spot surrounding a small, round, black one at tip of vertex, a row of three small spots between this and the eye on either side, an oval spot on the base of the front, another on the disc, a triangular spot just inside the antennae and another above the lorae, testaceous orange. Pronotum fuscous or black, a pair of large pupillate spots on the anterior half of the disc and a few irregular spots toward the humeral angles, testaceous. Scutellum black, the apex and a pair of spots on the lateral margins yellow. Elytra black, a bright lemon yellow saddle extending from apex of scutellum two-thirds the distance to the apex of clavus and laterally nearly to the costa, basal and apical veinlets marked with yellow.

Genitalia;— ultimate ventral segment of ♀ half longer than penultimate, the posterior margin nearly truncate, very slightly notched in the middle.

Described from a single female taken at Port au Prince, Hayti in Feb. by Mr. Crew. The yellow saddle renders this so distinct and well marked a species that I have no hesitancy in describing it from a single example.

Agallia barretti n. sp.

Intermediate in character between *4-punctata* and *sanguinolenta* groups. Black with a few light markings. Length 4 mm.; width 1.5 mm.

Vertex very narrow as seen from above, evenly rounding, parallel margined, not extending behind the eyes; front broad above, produced over the antennal sockets, rapidly narrowing below, genae narrow scarcely extending beyond inner margin of eye, sharply angled, the margins straight; pronotum finely granulated, faintly transversely rugulose; elytra broad and stout, venation as in *4-punctata* with a few irregular veinlets, the outer claval nervure forked behind.

Color; dead black, four equidistant points on the posterior margin of the vertex, an interrupted circle around each ocellus, a large irregular spot on the base of the front, a smaller one on the margin below each antenna, the inner margin of the eyes and the outer margin of the genae, white or pale yellow; pronotum with three pale points in a triangle on the disc; elytra dark fuscous to black, the cross-nervures between the sectors and nearly all the nervures beyond the middle irregularly mottled with white.

Genitalia; ultimate ventral segment of the ♀ slightly longer than the penultimate, lateral margin straight, posterior margin broadly rounding, a faint median notch.

Described from two females from Cuernavaca, Mex., from O. W. Barrett who has supplied me with a large amount of good material. The irregular venation and the forked claval nervure will separate this from any of the *sanguinolenta* group, to which it must be referred.

Agallia cinerea O. & B.

A. sanguinolenta var. *inconspicua* Baker. This species is now known from Ia., Colo., Calif., Ariz., and Mex. The Arizona specimens are larger than the types or than Baker describes.

Agallia peregrinans Stål.

Agallia lyrata Baker. Baker's description evidently applies to the form that we have determined as the above. It was described from Calif. yet he describes two more species from the same place, in the same group, without making any provision for it. It occurs from Vancouver to southern California.

Macropsis Lewis.

Oncopsis Burm., *Stragania* Stål, *Pachyopsis* Uhl., *Gargaropsis* Fowl.

W. W. Fowler in his work on the

Membracidae of the Biologia* described as a new genus and species *Gargaropsis innervis* which he placed in Centrotinae remarking that it was "one of the puzzling genera which appear to be rightly placed at the end of the Centrotinae and which on the other hand scarcely appear to be true Membracids." "The present genus is very distinct from any other described and does not seem to have any very striking affinities." Certainly not in Membracidae. It is a typical *Macropsis* by description and figure and from its size may be distinct from either of Stål's species.

It is rather a sad commentary on the accuracy of Fowler's work in the Biologia on Jassidae at least, which he is just beginning, that he should have described as one of the Membracidae a well known Jassid genus of almost world wide distribution, two species of which occur commonly in his own country.

Mr. Baker in a recent paper on the genus† described six species as new to North America. He was evidently not aware of Osborn and Ball's description of *apicalis* from Iowa‡ described two years before his paper, nor of Fowler's species from Mex. of three years before, as he mentioned neither of them in his distribution of the species.

Most of his new species were based on a very meager amount of material and are of very doubtful validity when compared with a larger series of specimens.

His *alabamensis* is *apicalis* O. & B. The white hair, dark suture, and three apical dots on elytra as well as the genitalia readily distinguish this species. His *rufoscutellata* (*us*) seems to be identical with specimens from Vera Cruz, Mex., the males of which fit Stål's description of *missella* (founded on a male) in every particular. It is a common Colo. species from the first foot hills up to 9000 ft. It varies much in the amount and depth of color on scutellum and clavus. Some specimens from both Colo. and Mex. have only a trace of testaceous while in others most of the clavus is covered with dark fuscous.

The species he described as *californica*(*us*) occurs very commonly here in Colo. It is also variable in size and color in a large series, some females being entirely pale green while others are very heavily marked with black. The elytra in these specimens very rarely show supernumerary veins, the notch in the female segment varies from rectangular, to rounding with a broad median tooth. A slight notch in this tooth would complete the variation necessary to form his *magna* (*us*) which was founded on a single female, undoubtedly only variety of his *californica*. I fail to comprehend what he means by "Pronotum without distinct supernumerary veins."

His *atra* is undoubtedly only another color variation of the *californica* male,

*Biologia Centrali Americana. Rhynch. Homop. Vol. II, p. 167. Pl. X.

†On some N. A. Species of Macropsis. Psyche, May 1900.

‡ Proc. Dav. Acad. Nat. Sc. VII, p. 64, Pl. II fig., 1,—Jan. 1898.

as he had but one male of each variety and it would be exceptional to find two from even the same locality exactly alike in color pattern. Baker suggests that *atra* may prove but a variety of *humilis* Stål, a suggestion that is undoubtedly correct as I have examined males from Vera Cruz that do not differ from the Colo. specimens except that they are slightly smaller, and this is also the case in *missella* the only other species occurring in both places.

Macropsis laeta Uhl.

var. paeta n. var.

Differs from typical laeta only in color. In life the whole insect is suffused with reddish, the hyaline elytra allowing the stronger color of the abdomen to show through. Dried specimens are of a delicate pink. This pink variety of a green species is analogous to the pink Katydid.

Summed up according to the above synonymy, the specific limits and distribution will be as follows. (The generic synonymy is given above.)

M. laeta Uhl. and var. **paeta** nov.
Known only from Colo.

M. apicalis O & B.
M. alabamensis Baker.
Iowa and Alabama.

M. robustus Uhl.
Ala. La. Texas, N. Mex., Ariz., Calif. and Colo.

M. missella Stål.
M. rufoscutellata Baker.
Colo., N. Mex. and Vera Cruz, Mex.

M. humilis Stål.
M. atra Baker, *M californica* Baker, *M. magna* Baker.
Colo., Calif. and Vera Cruz.

M. innervis Fowler.
Mex. — Unknown in nature. Its description (as a Membracid) not giving specific characters. It may fall under one of the other species.

M. (?) idioceroides Baker.
N. Mex. — I doubt very much whether it belongs to the genus at all.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XVI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Euchleana serrata Dru. The larva is here described for the first time.

Egg. Laid loosely, rolling around in the tumbler like sand. In nature doubtless falling upon the ground. Elliptical, not flattened, but of less diameter on one direction, both ends rounded, one (micropylar) slightly more flattened. Reticulations large, about 12 the length of the egg, very strongly raised, forming ridges, the reticulations wider than long and arranged in nearly straight rows the length of the egg, forming longitudinal waved ridges, which are, however, exactly like the cross striae except that the latter are alternating. Joinings of reticulations with white points in oblique view, not seen from above. Surface finely shagreened. Bright bluish green, later dark red. Size .8 × .5 × .4 mm.

Stage I. Head round, pale brownish, mottled, slightly darker in a line above the black ocelli, and with whitish over the face; width about .3 mm. Body rather short, not slender, feet large, cervical shield and anal plate also large but not strongly cornified. Body white, a broad regular, subdorsal, purple-brown stripe, obsolete on the cervical shield, the pair joined dorsally on joints 10–13 and becoming a narrow dorsal line on the anal plate. A broad ventral similarly colored band, absent on the segments with feet, but narrowly tinting their bases. Feet pale. Setae short, black, with slightly swollen tips, some of those at the ends and on the feet longer and with sharp tips. Tubercles i and ii nearly in line, remote; iii well before and above the spiracle; iv well below and somewhat behind it; v below iii, vi absent, vii with three setae well separated and arranged in a triangle; viii in the ventral dark band. On the thorax the subprimary setae are absent, iib a very long hair, not glandular and with a large tubercle.

Stage II. Head rounded, not bilobed, mouth pointed and projecting, clypeus rounded above; pale brown, sutures dark brown, lobes marked with brown dots in vertical bands; width .45 mm. The head is held out flat. Body cylindrical, moderate, thoracic feet appressed. Whitish green on the sides, a broad purple-brown subdorsal band, the pair united into a dorsal band on joints 10–13, obscurely geminate on the thorax, distinctly so and becoming light red on the cervical shield. A broad ventral stripe of the same dark color covering all the feet except on the lateral aspect.

Stage III. Head rounded, held out flat, pale brownish, dotted with dark across the face in three irregular transverse bands, the first vertical, second across the clypeus, third at base of antennae; ocelli black, antennae whitish; width .65 mm. Body whitish green, a subdorsal dark brown band, pulverulent and obscurely double, becoming a single dorsal band on joints 10–13. A single similar ventral stripe. Feet pale outwardly.

Stage IV. Head obscurely pale brownish, dotted with dark brown, most distinctly in a vertical stripe on the lobes. Rounded, not bilobed; width .9 mm. Body moderately slender, smooth, obscure grayish green, the double band joining behind and the ventral band as before, but grayish brown, not contrasting and all finely, obscurely, longitudinally lined with whitish.

The larvae reached this stage September 4th and were hibernating by October 1st.

Stage V. The moult took place sometime in the winter, in February or March, I think. The larvae were described April 30th and had not, at that time, begun to feed.

Head flattened and held out flat, broad, square at the mouth, median suture depressed, antennae large and curving inward; gray, whitish about the clypeus, longitudinally streaked on the sides of the lobes, tip of antennae dark ocher; width 1.2 mm. Body slender, somewhat flattened, smooth; shields not visible, anal flap conical with a small tubercle each side the tip; prongs large, contiguous. Gray, obscurely longitudinally striped. Broad dark subdorsal and stigmatal lines on a light ground, between which are fine addorsal, lateral, suprastigmatal, two lower subventral and ventral lines. Tubercles small, black, not elevated. Spiracles black ringed. Feet gray.

Stage VI. Head flattened, squarish, the apex under joint 2; bark brown, clypeus pale, three vertical straight whitish streaks on each lobe, the one on lateral angle prominent and broad; width 1.7 mm. Body moderate, cylindrical, smooth, reddish brown, finely lined with black and with a yellowish white substigmatal line, linear except below the spiracles where it is diffusely blotched. The lines are dorsal geminate reddish, double confluent subdorsal blackish; lateral space shaded with red with indistinct lines; three subconfluent suprastigmatal black lines, four diffuse subventral ones, a red shade and finally three ventral blackish lines, subconfluent, the last geminate. Thoracic feet and antennae whitish gray; abdominal ones and anal prongs mottled. Spiracles white, black rimmed.

Stage VII. Head flat and held out flat, square, apex under joint 2; antennae large, projecting, curved inward like claws; gray, a whitish ground peppered with black and brown, heavily streaked on the sides with dark as before. The body is smooth, no humps, moderate, the thoracic feet flat and appressed. Bark brown in appearance, longitudinally lined. Tubercles small, distinct, slightly elevated, black. Cervical shield, anal plate and anal leg shields colored like the body but more whitish and mottled. The lines are fine and numerous, crinkly, ill defined. A subdorsal (tubercle ii) is blackish and rather distinctly limits the broad dorsal space which is filled with brown wavy marks; lateral region with some rather strong lines and the subventral region also blackish. The lines tend to alternate, brown and black but are much confused. Ground color light gray, almost white, but largely obscured.

Stage VIII. Head flat and held out flat, apex narrowly under joint 2; quadrate, clypeus centrally and tops of lobes a little bulging, paraclypeal pieces reaching nearly to vertex; antennae large, projecting, a little curved inward; gray shaded with brown, mottled, epistoma and central part of paraclypeal pieces whitish; a diffuse luteous line on each side of the median suture and on the sides of the lobes, parallel to the markings on the body; antennae pale; width 3.3 mm. Body slightly flattened, robust, only moderately elongated, uniform, no lumps. Tubercles elevated, conic, thorn-like, more distinct on the posterior half of the body, but small throughout. Thoracic feet curved, appressed; abdominal ones large, joint 13 with a large triangular plate produced behind into thick subanal prongs. Anal plate triangular with a central carina posteriorly that becomes a groove anteriorly, the posterior edge of the plate dentated by four tubercles. Setae short and pointed, longer on the anal plate. Rich brown and blackish, relieved by white. Ground white, almost entirely overlaid by the other colors. Dorsal space mottled red-brown and ocherous, an ill defined geminate dorsal line, showing blackish on the thorax and posteriorly at the ends of the segments. A broad shaded blackish subdorsal band; lateral and stigmatal blackish bands, all ill defined, mottled, the spaces between shaded with ocherous and brown, with white showing in spots on the posterior edges of segments. A broad subventral band, a narrower one each side of the medio-ventral band, all dark and like the others. Spaces between similarly mottled. Venter of joint and 5 spots below the spiracles on the subventral fold are lighter, yellow between the dark bands which are not interrupted. Thoracic feet whitish; abdominal ones darkly mottled, blackish gray. Lines continuous over the shields. Spiracles gray, black rimmed.

Food plant unknown. The larvae ate maple in preference to apple and weeds with which they were supplied, and fed upon this tree; probably their native food plants are various. Single brooded, eggs July 28th, mature larvae the following June. Moth from Summit, New Jersey.

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THE SPECIES OF CIRCOTETTIX, A NORTH AMERICAN GENUS OF OEDIPODINAE.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Circotettix was established by me in 1876 upon *Oedipoda undulata* Thom.; and two other species, one of them then undescribed, were mentioned as belonging to it. In the same year Thomas described an additional species and five years later I published the undescribed species above mentioned. In 1884 Saussure added two more and revised the whole genus (Prodr. Oedip.) and afterwards described a sixth species in his Additamenta. Since then Bruner has described several species, referring some of them here and some elsewhere. In my recent Catalogue of N. A. Orthoptera eleven species are listed, but since its publication I have undertaken a new study of the species, necessitating some changes, the result of which appears in the subjoined table of ten species, to which I have added a few notes, principally on distribution.

In this table I have distinguished the radials (radiate veins) of the anal area of the hind wings, as superjacent or subjacent, according as they rise above or fall below the general plane of the wing; the first superjacent radial terminates in the middle of the axillary lobe.

In the last two species, aberrant members of the genus, the arrangement and relations of the first subjacent and superjacent radials of the hind wings closely resemble the same features in *C. verruculatus*, next which they are placed.

Oedipoda sparsa Thom., which is probably a Circotettix, is not included in the table, as I have not seen it recently and it is at present indeterminable. The type is lost and although the figure given in Wheeler's report shows hind wings of a shape hardly consistent with Circotettix, yet when the genus was established I had evidently seen the species and regarded it as a Circotettix. Saussure also so regarded it.

Circotettix in the New World is represented by the genus Bryodema in the Old World, but the former is much the richer in species.

Table of the Species of Circotettix.

A[1]. Insects of medium or large size. Pronotum acutangulate or rectangulate behind, rarely feebly obtusangulate; first (humeral) lobe of hind wings distinctly elongated, protruding distinctly beyond the general curve of the outer margin, which is generally lobate.

b[1]. Tegmina relatively broad; general form of hind wings subfalcate, the curve of the outer margin distinctly sinuate, the radiate field very broad and full, and the humeral field relatively broad.

c[1]. Hind wings fuscous or else thalassine at base, rarely hyaline, and not crossed by a mesial fuscous band.

d[1]. Hind wings fuscous at base or hyaline with very heavily infuscated radiate veins; upper fork of first subjacent radial free, and relatively distant from the first superjacent radial.

e[1]. Of relatively small size, the tegmina hardly exceeding 25 mm. in length; hind wings wholly blackish fuscous or with only the apical fourth or less hyaline. . . . . 1. *maculatus.*

e[2]. Of relatively large size, the tegmina nearly 35 mm. in length; hind wings hyaline with very heavily infuscated radials and the whole base generally black to a varying distance up to more than half of the wing. 2. *carlinianus.*

d[2]. Whole of hind wings thalassine; upper fork of first subjacent radial running very close to the first superjacent radial and finally uniting with it. 3. *thalassinus.*

c[2]. Hind wings more or less sulphureous* at base, and more or less distinctly crossed by a mesial fuscous band.

d[1]. Basal half of hind wings with very weak coloring, almost hyaline; upper branch of first subjacent radial free; apical margin of axillary lobe strongly arcuate, the lobes below it distinctly emarginate . . . 4. *lobatus.*

d[2]. Basal half of hind wings with rather strong coloring; upper branch of first subjacent radial uniting with the first superjacent radial; apical margin of axillary lobe obliquely truncate, but little arcuate, the remaining lobes apically subtruncate.

e[1]. Markings of tegmina less conspicuous, and more distinctly clustered into three transverse fasciae; upper branch of first subjacent radial run-

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* *C. lobatus* is described by Saussure as having the basal half of the hind wings "dilute hyalino-sulfurescens *vel thalassina.*" I have seen none with the latter coloring, but it may easily be distinguished from the species of the preceding alternate category by its transverse mesial band, though this is incomplete.

ning for some distance beside and close to the first superjacent radial, before uniting abruptly with it; hind tibiae pale dull yellow, but black at base . . . . 5. *undulatus.*

c^2. Markings of tegmina generally very conspicuous and pretty uniformly distributed; upper branch of first subjacent radial uniting at once (as an oblique cross vein) with the first superjacent radial, which is of about the same thickness as the next superjacent radial; hind tibiae dark glaucous, with a pale yellow post-basal annulus and a black base . 6. *shastanus.*

b^2. Tegmina relatively narrow; hind wings narrower than in the alternate category, with but feeble indication of falcation, the radiate field scarcely broader than is usual in Trimerotropis, the humeral field relatively narrow, the basal half sulphureous, beyond more or less infuscated.

c^1. Lateral foveolae of the head triangular but distinctly elongate; hind wings wholly infuscated in apical half, though of deeper intensity next the sulphureous base, the costal stigma generally deeply infumated; hind tibiae plumbeo-glaucous, with a post-basal yellowish annulus . . . 7. *suffusus.*

c^2. Lateral foveolae of the head equilateral or nearly so; hind wings infuscated beyond the sulphureous base only in a band of irregular width across the middle and at the apex, the intervening region hyaline with fuscous veins, the costal stigma luteous though black margined; hind tibiae yellowish with black base and apex, and with mesial fuscous cloudings beneath.

8. *verruculatus.*

A. Insects of relatively small size. Pronotum obtusangulate behind, generally distinctly so; front (humeral) lobe of hind wings not protruding in any noticeable way beyond the general curve of the outer margin, which is not or barely lobate.

b^1. Tegmina distinctly flecked with fuscous; hind wings broad, hyaline, with luteous marginal stigma; hind tibiae dull yellow . . . 9. *perplexus.*

b^2. Tegmina obscurely clouded with fuscous; hind wings narrow, crossed by a strongly arcuate narrow fuscous band and with fuscous marginal stigma, the base very faintly washed with greenish yellow; hind tibiae pale glaucous.

10. *occidentalis.*

1. Circotettix maculatus.

Circotettix maculatus Scudd.!, Rep. U. S. ent. comm., ii, App., 26, pl. 17, fig. 10 (1881); Sauss., Prodr. Oedip. 176–177 (1884).

The specimens I have seen come from Nevada, July (O. S. Westcott). Mts. near Lake Tahoe, Nev., Oct. (H. W. Henshaw — Wheeler's expl.), Sierra Nevada, July 17–22 (Baron Osten Sacken), Truckee, Cal., Oct. 10 (Scudder), Tahoe Co. Cal. (Stanf. Univ.), and Cloud's Rest, Yosemite Valley, Cal., Aug. 12 (A. P. Morse).

2. Circotettix carlinianus.

Oedipoda carliniana Thom., Proc. acad. nat. sc. Philad., 1870, 81 (1870).

Oedipoda carlingiana Thom., Ann. rep. U. S. geol. surv. terr., II, 265, 275 (1871); Thom., Syn. Acrid. N. A., 126 (1873).

Circotettix carlingianus Thom., Proc. Dav. acad. nat. sc., I, 254–255 (1876); Sauss., Prodr. Oedip., 176 (1884).

Circotettix carlinianus Scudd., Proc. Dav. acad. nat. sc., VIII, 42 (1900).

Named, according to Thomas, after Col. Carlin. The *g* has entered the name apparently as a typographical error.

This species varies greatly in the coloring of the wings as regards the extension from the base of the fuscous infumation; it may cover more than half the wing, or it may be entirely absent except from the veins, but in the latter case there is often a faint indication of the upper portion of a median cross-band, as in some other species; this is especially the case with specimens from British Columbia, but is also seen in one from southern Colorado. British Columbia specimens are also smaller than those from further south.

In my notes on the songs of our Orthoptera given in the 23d Report of the Entomological society of Ontario, p. 78, I have made for this species statements which belong instead to *C. undulatus.* The present species is by no means so noisy, remaining only five or six seconds in the air during its flights, and making a rustling sound rather than a crackle,— in fact more closely resembling the faint rustle of *C. maculatus.*

I have before me specimens from the following localities, all, unless otherwise specified, taken by myself:— Colorado, 7–8000′ (Morrison); Garland, Col., 8000′, Aug. 28–29; Pueblo, Col., July 8–9; South Park, Col., 8–10000′, Aug. 11–16; Douglas Creek, Col., Aug. 22; White River, Col., July 24–Aug. 13; Green River, Wyo., July 21–31; Alkali Station, Wyo., 6000′, July 27; Fossil, Wyo., Sept. 2; Parowan, Utah, 6000′, July 3–10 (Palmer); Reno, Nev., Aug. 18 (Packard); British Columbia and Vancouver Is. (Crotch). Other regions from which it has been reported are: from Ft. Benton, Mont., to Ft. McLeod, Alberta (Bruner), Montana (Thomas, Bruner), the Yellowstone region (Bruner, Saussure), Yakima Wash., and northwestern Nebraska (Bruner).

3. Circotettix thalassinus.

Circotettix thalassinus Sauss., Prodr. Oedip., 177–178 (1884).

I have received this species only from Nevada (H. Edwards), from which state it was described by Saussure, and from Tahoe Co., Cal., August (Mus. Leland Stanford Univ.).

4. Circotettix lobatus.

Circotettix lobatus Sauss., Add. prodr. Oedip., 65–66, pl., fig. 5 (1888).

Circotettix lapidicola Brun.!, Proc. U. S. nat. mus., XII, 75–76 (1890).

My single specimen was received

from Bruner, and comes from Salmon City, Idaho. Saussure's specimens come from Colorado. The synonymy is pretty evident.

5. Circotettix undulatus.

Oedipoda undulata Thom., Ann. rep. U. S. geol. surv. terr., V, 460 (1871); Thom., Syn. Acrid. N. A., 125–126 (1873).

Circotettix undulatus Scudd., Bull. U. S. geol. surv. terr., II, 265 (1876); Sauss., Prodr. Oedip., 177 (1884); Sauss., Add. prodr. Oedip., 65, pl. fig. 6 (1888).

To this species belong the remarks I have made under *C. carlinianus* (Rep. ent. soc. Ont., XXIII, 78) concerning the noise made by the insect in flight.

Specimens at hand, all taken by myself unless otherwise indicated, come from the top of the range between the Sapello and Pecos rivers, N. Mex. 11000′, Aug. (Cockerell); Colorado (Morrison); Garland, Col., 8000′, Aug. 28–29; Sierra Blanca, Col., below timber line, 11–12000′, Aug. 29; Florissant, Col., 8000′, June, Aug. 17–22; South Park, Col., 8–10000′, Aug. 11–15; above Alma, Col., 10000′, Aug. 13–14; Empire City, Col. (Palmer); Georgetown, Col., 7500–8500′, July 11–18; Grand River, Col., Aug. 22; Roan Mts., Col., Aug. 16–17; Provo, Utah, Aug. 23–24; American Fork Cañon, Utah, 9500′, Aug. 2–3; Wahsatch Mts. near Beaver, Utah, July 12–18 (Palmer); Alkali Station, Wyo., July 27; Fossil, Wyo., Sept. 2; Yellowstone Park, Sept. 6–12. Other districts besides the above from which it has been reported are: Nebraska (Dodge, Bruner), Montana (Bruner), Nevada (Thomas, Saussure), Yakima, Wash. (Bruner), Victoria (Fletcher).

6. Circotettix shastanus.

Circotettix shastanus Brun., Proc. U. S. nat. mus., XII, 76–77 (1890).

Of rather slender form, compressed, faintly pubescent, brownish testaceous, heavily flecked especially on tegmina with dark or blackish fuscous; the pronotum typically with a large central spot above and a patch at the upper limit of the lateral lobes on the prozona; the tegmina heavily flecked almost uniformly throughout but especially on basal half with blackish fuscous, deeper in tint in southern examples, there being but faint traces of transverse fasciation. Head testaceous, all the carinae punctate with black, the fastigium of vertex shallow but with raised margins and a feeble median carina; antennae dull testaceous banded with fuscous. Pronotum posteriorly rectangulate, the margin of the process punctate or interrupted with black. Tegmina broad; hind wings subfalcate, pale sulphureous basally, this color often extending further along the rays, crossed just beyond the middle by an unequal, sometimes broken, more or less cloudy, fuscous band, sending a taenia nearly half way to the base in the humeral field, the apical portion of the wing hyaline with fuscous veins, the costal stigma infumate; form of the wings precisely as in *C. undulatus*, but the venation differing in that the upper branch of the first subjacent radial unites at birth, as an oblique cross-vein, with the first superjacent radial, in which point it differs from all the other species. Hind femora cinereo-testaceous, thrice fasciate with blackish fuscous;

hind tibiae dark glaucous, with a pale yellow post-basal annulus and a black base.

Length of body, ♂, 26 mm., ♀, 30 mm.; antennae, ♂, 9.25 mm., ♀, 10 mm.; tegmina, ♂, 29.5 mm., ♀, 29 mm ; hind tibiae, ♂ ♀, 11.5 mm.

8 ♂, 12 ♀. Siskiyou, Or., Sept. 6; Yosemite Valley, Cal., Aug. 11, A. P. Morse.

I redescribe this species because I am not quite sure that it is identical with Bruner's *C. shastanus.* That was described from a single specimen from Shasta Co. Cal., which I have not seen, and which, if now in existence is in the national museum. Bruner describes the tegmina as agreeing in markings with those of his *C. lapidicola* (*C. lobatus* Sauss.), but in their conspicuous mottling my specimens are widely different from a specimen of *C. lapidicola* sent me by Bruner, in which the markings are nearly obliterated. There is however a wide difference also in this respect between the specimens before me from Oregon and the Yosemite valley, the latter being far more distinctly mottled, so that I am inclined to lay little stress on this point. In the structural features of the wings, the specimens before me agree well with Bruner's description.

7. Circotettix suffusus.

Trimerotropis suffusus Scudd.!, Bull. U. S. geol. surv. terr., II, 265 (1876).

Circotettix suffusus Scudd., Proc. Davenp. acad. nat. sc., VIII, 43 (1900).

Trimerotropis columbia Scudd.!, Rep. ent. soc. Ont., XXIII, 77 (1893).

Circotettix suffusus is a stepping stone toward the fallax group of Trimerotropis and is with difficulty separable from *T. fallax*; the veins of the hind wings are but little thickened and the markings of the wings are much the same. In *C. suffusus*, however, the infumation in the middle of the wings is generally deeper. To a less extent than in the other species of Circotettix, the cells of the outer half of the anal area are predominantly tranverse, while in *T. fallax* they are usually polygonal and subequal.

I have seen specimens from Vancouver Isl. (Edwards, Crotch), British Columbia (Crotch), Nanaimo and Sandon B. C. (Fletcher), Oregon City, Or., July (Harford), Sierra Nevada (Edwards), vicinity of Lake Tahoe, Nev., Sept., Oct. (Henshaw — Wheeler's expl.), and Colorado, 8500′,–10000′ (Morrison); and have taken it myself at American Fork Cañon, Utah, 9500′, Aug. 23, Garland, Col., 8000′, Aug. 28–29, Manitou, Col., 6300′, Aug. 24–25, Florissant, Col., 8000′, Aug. 17–22, Alma, Col., 10000′, Aug. 13–14, north fork of South Platte, Col., Aug. 10, Evanston, Wyo., 6800′, Aug. 6, and Yellowstone Park, Sept. 6–12. It has also been reported from Washington (Bruner), and wrongly by me from Mt. Shasta, Cala., the reference being properly to *T. fallax.*

8. Circotettix verruculatus.

Locusta verruculata Kirby, Faun. bor. amer., IV, 250 (1837).

Oedipoda verruculata Scudd., Can.

nat., VII, 287 (1862); Thom., Syn. Acrid. N. A., 115–116 (1873).

Trimerotropis verruculata Scudd., Hitchc., Rep. geol. N. H., I, 377, fig. 57 (1874).

Circotettix verruculatus Sauss., Prodr. Oedip., 175–176 (1884).

Locusta latipennis Harr., Ins. inj. veg., 144 (1841).

I have seen specimens from Nova Scotia (Piers); Mt. Desert Isl. and Moosehead Lake, Me. (Scudder); White Mts. N. H., valleys and summits, late July and early August (Scudder); Sudbury, Vt. (Scudder); Princeton and summit of Graylock, Mass. (Scudder). Summit of Mt. Tom, Mass. (Shurtleff); Chateaugay Lake, Adirondacks, N. Y. 2000′, (Bowditch); Montreal (Caulfield); Prescott (Billings); Sudbury (Scudder), and DeGrassi Point, Ont., July 31 (Walker); southern Illinois (Thomas); Red River (Gunn), and Dufferin, Manit. (Dawson); Wigwam Point, Lake Winnipeg (Scudder); British Columbia (Crotch); Vancouver Isl. (Edwards); and the upper McKenzie River, Great Bear Lake and Arctic America (Kennicott). It has further been reported from New Haven, Conn. (Smith); vicinity New York City (Beutenmüller); New Jersey (Smith); Quebec (Scudder) and Saguenay River (Norton); Lake Simcoe, northern Ontario and Lake Superior (Walker); Minnesota (Lugger); Illinois and Montana (McNeill); Nebraska (Bruner); Colorado (Saussure, Cockerell); Dakota and Montana (Bruner); California (Saussure); Saskatchewan region (Scudder); and Lat. 57° [Athabasca] (Kirby). It is also credited to Mississippi by Saussure, but surely by error. Probably the references to Colorado and California belong to *C. suffusus.*

9. Circotettix perplexus.

Trimerotropis perplexa Brun.!, Proc. U. S. nat. mus., XII, 74–75 (1890).

Mr. Bruner has sent me one of his types from Chadron, Nebr., Aug. It has not been reported from any other point.

10. Circotettix occidentalis.

Oedipoda (?) *occidentalis* Brun.!, Proc. U. S. nat. mus., XII, 77–78, pl. 1, fig. 7 (1890).

Circotettix (?) *occidentalis* Scudd., Proc. Dav. acad. nat. sc., VIII, 43 (1900).

It was described from the vicinity of San Francisco, Cal., November, and has not been reported elsewhere. I owe my specimens to Professor Bruner.

11. Circotettix sparsus.

Oedipoda sparsa Thom., Rep. U. S. geol. surv. w. 100 mer. V, 883, pl. 45, fig. 6 (1875).

Circotettix sparsus Scudd., Bull. U. S. geol. surv. terr., II, 265 (1876.)

Described by Thomas from New Mexico and since 1876 unrecognized. See a paragraph above, just preceding the table.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XVII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Abbotana clemataria Abb. & Smith. The mature larva has been figured by Abbot. Packard briefly describes this figure and Bruce has published a short note on the food plants.

Egg. Laid in a large mass of about 300, closely on a twig, all erect on the smaller end like Clisiocampa, but naked. Elliptical, flattened on two sides and a little concave, the larger end distinctly flattened truncate, side view slightly wedge-shaped. Reticulations very faint, not showing as lines, but as slight, roundly hexagonal flattenings, except just around the rim of the apical truncation where they form a row of slightly raised ridges composed of the raised sides of one series of cells, rather broad and diffuse, and at the micropyle where there are some small, rather distinct reticulations. Size .7 × .55 ×. 45 mm.

Stage I. Head broad, rounded, flattened before, mouth pointed; free, black, epistoma and labrum pale whitish; width .3 mm. Body slender, but not greatly elongated, flattened dorso-ventrally. Broadly black dorsally and ventrally leaving a white lateral stripe from joint 2 to the anal plate, which is pale with reddish central and lateral lines. Cervical shield dark like the dorsum, obscure. Anal feet reddish, those of joint 10 darker than 13. Setae dusky with small glandular tips, rather stout, arising from moderate tubercles, paler than the ground color but not contrasting, i and ii nearly in line, iii below ii, iv substigmatal posterior, no subprimaries; four setae on the cervical shield, two detached. The white side stripe covers the leg plate of joint 13, not that of 10; claspers of feet pale. Segments finely, not very regularly annulate. Thoracic feet pale, darker shaded outwardly. On eating, the white parts became greenish and the dark ones turned pale vinous.

Stage II. Head rounded bilobed, clypeus moderate, sunken, lobes full; slaty black, epistoma and antennae white, mouth pale; width .6 mm. Body moderate, somewhat robust, smooth, scarcely annulate; entirely slaty black, only the claspers of abdominal feet pale yellowish. Tubercles small, dark, setae rather distinct, dusky, short. Skin not shining except slightly in the folds. Later shining olivaceous slaty black, no marks.

Stage III. Head rounded, full, slightly bilobed, apex free from joint 2, clypeus large, broad, moderately high; slaty black, labrum and labium white, slight white streakings on the sides above ocelli; width 1.2 mm. Body rather robust, not greatly elongated, wrinkly subannulate, especially posteriorly on the segments, smooth, the tubercles slightly elevated, especially on joint 12 posteriorly. Anal plate broadly triangular, rounded at the tip; anal prongs thick; anal feet projecting laterally. All brownish black not shining, no distinct marks; foot of joint 10 outwardly pale; venter a trace lighter than dorsum, obscurely longitudinally streaked. Tubercles iv and v obscurely white ringed · setae short, black. Thoracic feet black, equal, appressed. Later the color is bronzy black centrally, duller at the ends, the tubercles a little elevated and lumpy, especially a subdorsal prominence on joint 3 which forms a more or less distinct dorsal collar.

Stage IV. Head rounded, slightly bilobed flattened before, free from joint 2; lobes full; clypeus to vertex, the paraclypeal pieces obscure; slaty black, the lower part of clypeus mottled with pale and the sides of lobes streaked; labrum and epistoma whitish, dull; antennae short, brown; width 2.2 mm. Body cylindrical, rather thick, robust, uni form; joint 3 anteriorly dorsally strongly collared, with a double lateral finger shaped process bearing tubercles iib and iv+v. A rounded process bearing tubercle ii of joint 8. Dorsal tubercles all slightly elevated; anal prongs short, projecting. Slaty black dorsally, a little bronzy, shading to sordid ocherous ventrally, mottled and streaked with black. Collar of joint 3 flesh colored before; processes orange spotted; orange dots on tubercles ii, iv and v and a larger one outside the finger process of joint 8. Foot of joint 10 brightly shaded outwardly. A black blotch on joint 8 subventrally. Thoracic and anal feet dark. Setae small except on the anal plate and with the hair tubercles black. The larva bends the head and joint 2 downward, forming an angle at joint 3, the feet of 4 crossing the others, making the anterior end look thick and club-shaped.

Stage V. Head shaped as before, but the back of the occiput covered by joint 2; labrum quadrate, emarginate, epistoma broad, clypeus triangular; purplish gray, thickly mottled on a white ground, somewhat spirally over the faces of the lobes; eyes black; last joint of antennae long and reddish; width 3.2 mm. Body as before, a little intensified in the characters. Joints 2 and 3 anteriorly abruptly rising to a high collared elevation on joint 3, angled subdorsally by the double finger processes. Dorsum descending to joint 5, then cylindrical and smooth (except for the small, produced tubercles, tubercle ii most produced) to joint 12, but tubercle ii of joint 8 very large, forming a high, club-shaped papilla; tubercle ii of joint 12 also prominent, but to a less degree. Anal plate rounded behind, the leg shield not produced posteriorly, the prongs thick, moderate. Purplish brown like bark, densely mottled, shields paler, the outside of the foot of joint 10 especially so; collar black, an orange patch before it, mottled; finger processes tipped with red; tubercles i to v form bright orange cushions bearing the black hair tubercle; tubercles vi and vii black all a little elevated. Spiracles white, black rimmed. Setae short, black, distinct. The half of the larva below the spiracles is lighter, more grayish than the dorsum; the base of the foot of joint 4 and venter of joint 8 are darkly shaded, also subdorsally on joint 12 and the papilla of joint 8. Later the ground color becomes alike all over, slightly ocherous gray, like bark, the marks the same, the dark patches more contrasted.

Spun among leaves on the ground. The eggs were found April 30th, on a chestnut twig, having apparently passed the winter in this state. The larvae began spinning about June 1st and the first moth appeared July 1st. The species therefore seems to be double brooded with hibernation in the egg state. The larvae were fed on oak till the developing leaves became too hard for their weak mandibles, after which they ate pear leaves. They seem to be general feeders for any leaves not too hard. Larvae from Washington, D. C.

SUPPLEMENTARY NOTES ON ORGYIA.

In PSYCHE vii, 340 (1896) I published some "final notes on Orgyia," giving a list of the American species of Notolophus. Since then some additional facts have come to light.

Notolophus oslari Barnes, Can. ent., xxxii, 45 (Feb., 1900); *libera* Strecker, Suppl. 3, Lep. Rhop. & Het., 29 (Mar., 1900).

This newly discovered form from the Rocky Mountain region is still unknown in the larva. It will prove of much interest, as the moth lies between *antiqua* and *vetusta*, two species hitherto not considered allied.

Notolophus inornata Beut., PSYCHE, v, 300 (1890).

I shall have to allow this form specific standing. Mr. Beutenmüller not long since collected additional material in Florida which shows a moth nearly allied to *definita* and possessing, like it, wool-covered eggs. He kindly directed me to the exact spot where his collections were made and I found there old egg-masses of the species, but nothing living. However, on Long Island, N. Y., I met with larvae like *leucostigma* but without the yellow subdorsal band. On breeding them I obtained a moth exactly like Mr. Beutenmüller's recent examples of *inornata*.

Harrison G. Dyar.

JORDAN AND KELLOGG'S ANIMAL LIFE (N. Y., Appleton, 1900, 8°) is an introduction to zoology of the most rational kind, abundantly and excellently illustrated. It is the only text-book of zoology we have ever seen which was readable almost from cover to cover. Generous space is given to insects. The authors point out "that the whole life of animals, . . . all the variety of animal form and habit is an expression of the fitness of animals to the varied circumstances and conditions of their living . . . [and that this adaptation has] come about inevitably and naturally, and that it can be readily studied and largely understood." The whole book makes this clear.

STANFORD UNIVERSITY'S COLLECTION OF JAPANESE SCALE INSECTS. — Mr. S. I. Kuwana, assistant in entomology in Stanford University, spent all of last summer in Japan collecting and studying in the field the scale insects of that country, this being the first attempt to make a systematic investigation of Japanese Coccidae. Mr. Kuwana visited and traveled over all of the larger islands of the Empire, and by reason of his knowledge of the language and geography of Japan was able to do very effective work. He gave special attention to the San José scale, in an attempt to solve, or at least to contribute to the solution of, the problem of the native habitat of this insect. This scale was found to be distributed over the whole empire, and in certain regions to be a serious pest. Mr. Kuwana is now engaged in working over his notes and material relating to the San José scale and finds much evidence to uphold the belief that the insect is native to Japan. He hopes to publish his notes about Christmas time. The collections made by Mr. Kuwana on this expedition, which are large, belong to the entomological laboratory of Stanford University. As far as the duplicate material will allow I shall be glad to make exchanges with students of the Coccidae, or to present specimens to them. Until the material is worked over, however, the collection will be kept intact.

Vernon L. Kellogg.

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PSYCHE.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.—II.

HYMENOPTERA PARASITICA.

BY WILLIAM H. ASHMEAD.

(1) **Pseudamblyteles neomexicanus**, new species.

♂.—Length 12.5 mm. Black; scape beneath, the upper anterior orbits, the face below the antennae, the clypeus, the labrum, the mandibles, the scutellum, the tegulae, a short line in front of same and one beneath, and the legs, except the anterior and middle coxae at base and posteriorly and the hind coxae, lemon-yellow; the extreme apex of hind tibiae fuscous. The anterior and middle coxae at the base and posteriorly and the hind coxae black; palpi yellowish-white. Wings hyaline, faintly tinged, the veins except towards base of wings, dark fuscous, the stigma within reddish brown. Abdomen black, the basal two thirds of the second and third dorsal segments and ventral segments 2 and 3 rufous, the latter with a fold.

Type.—Cat. No. 5324, U. S. N. M. (One ♂ specimen.)

(2) **Platylabus tibialis**, new species.

♀.—Length 8 mm. Black; a narrow stripe on hind orbits, a narrow band before base of mandibles, and the last two joints of maxillary and labial palpi, white or whitish. Mandibles black with a rufous spot near apex. Legs rufous; the coxae, the extreme apex of hind femora the hind tibiae, except toward base, and the hind tarsi black, the hind coxae marked with rufous. Wings subfuscous, the stigma and veins dark fuscous, almost black. Antennal joints 14 and 15 with a white spot above.

Type.—Cat. No. 5325, U. S. N. M. (One ♀ specimen.)

Allied to and difficult to distinguish from *Platylabus pedatorius* Fabr., of Europe.

(3) **Cryptus proximus** Cresson. One ♀ specimen. This species is found in Colorado, British Columbia, California and Alaska.

(4) **Itoplectis exareolata**, new species.

♀.—Length 6 mm. Black; the apex of abdominal segments 1 to 3 narrowly rufous, or rufo-piceous; the legs rufous, the anterior coxae basally, the hind tibiae, except a pale annulus at basal third, and the hind tarsi, except joints 1 and 2 narrowly at base, are black or very dark fuscous; the annulus on the hind tibiae, the spurs and the annulus at base of joints 1 and 2 of tarsi, are whitish. Mandibles, antennae and tegulae wholly black. Wings hyaline, the stigma and veins blackish, but with a white streak between the stigma and the parastigma. Metathorax exareolated, without a trace of a carina. Abdomen normal, punctate; the ovipositor about two thirds the length of abdomen.

Type. — Cat. No. 5326, U. S. N. M. (One ♀ specimen.)

(5) **Alexeter canaliculatus** Provancher.

One ♂ specimen.

(6) **Otlophorus affinis**, new species.

♂. — Length 6 mm. Black; the anterior half of the clypeus, the tegulae and abdominal segments 2–5 rufous; mandibles, palpi, anterior and middle tibiae and tarsi, except last joint, pale yellowish, or yellowish-white; all coxae, a spot on the anterior and middle trochanters above and the hind legs, mostly black, the extreme base of the hind femora and more or less of their apices, rufous; an annulus at base of hind tibiae, the tibial spurs and the base of the first joint of tarsi, whitish; two apical segments of the abdomen fuscous. Wings obscure hyaline, the stigma and veins brownish, the stigma having a whitish spot at basal third.

Type. — Cat. No. 5327, U. S. N. M. (One ♂ specimen.)

Comes nearest to *Otlophorus innumerabilis* Davis, but differs in color of the legs and by the disco-cubital nervure not being broken by a stump of a vein.

(7) **Limneria striatipes**, new species.

♀. — Length 7 mm. Black; mandibles, except at base and apex, the palpi, the tegulae, the subcostal and the median veins toward base in both wings, pale yellow, or yellowish white, the rest of the veins black or blackish, the stigma within being ferruginous, the anterior femora, except a large spot at base beneath, their tibiae and tarsi, pale ferruginous, the middle and hind legs mostly black, their tibiae having a long whitish stripe beneath and within; the tibial spurs, as well as the extreme base of the first joint of tarsi, are whitish. Metathorax areolated, the areola longer than wide, hexagonal.

♂. — Length 4.5 mm. Differs from the female in its smaller size and in the color of the legs: The anterior and middle coxae beneath and their trochanters, except the first joint above, are yellowish-white, the anterior femora have no black spot at base beneath, the middle femora are mostly rufous, while the hind femora are rufous at base.

Type. — Cat. No. 5328, U. S. N. M. (One ♀, one ♂ specimen.)

(8) **Cidaphurus alticola**, new species.

♂. — Length 12 mm. Black and yellow, the ground color of the head and the thorax black; scape beneath, the posterior orbits, the anterior orbits and the face below the antennae, except a median stripe, the malar space and the lateral incisions of the clypeus which are black, the clypeus, the mandibles except at apex and a spot at basal angle within, the legs except middle coxae at base and behind, the hind coxae within and at apex, a V-shaped mark at each anterior lateral angle of the mesonotum, the scutellum, except the fovea at base and the spine, the postscutellum, a band across the apex of the metathorax extending as a spot on the metapleura, the tegulae, a spot beneath a perpendicular line on the mesopleura, a spot beneath the insertion of the hind wings, two short stripes on upper margin of the pronotum, and a spot on the prosternum above the insertion of the front coxae, yellow. Wings subhyaline, the internal veins blackish, the costal vein and the stigma brown. Abdomen subcompressed, the basal two thirds of the first segment and bands at the base of the following segments black.

Type. — Cat. No. 5329, U. S. N. M. (One ♂ specimen.)

Allied to *Cidaphurus* (*Banchus*) *spinosus* Cresson, described from Colorado.

DIPTERA.

BY D. W. COQUILLETT.

Culex impiger Walker. This species extends over nearly the whole of North America, ranging as far southward as Jamaica, W. Ind.

Simulium venustum Say. Ranges from Canada and British Columbia southward to southern Florida and Texas.

Rhypholophus cockerellii, sp. nov.

Light yellow, the antennae and palpi except basal joint, brown (legs broken off in the single specimen); joints of flagellum of antennae elongate oval, each bearing a whorl of bristles; wings hyaline, stigma very faint, discal cell opens into the third posterior, auxiliary crossvein slightly before middle of distance from base of third vein to apex of the auxiliary, marginal crossvein near base of anterior branch of second vein, seventh vein diverging from the sixth on its basal three-fourths, then extending parallel with it; length, 4 mm.

A female specimen. Type No. 5317, U. S. Nat. Museum.

Limnophila costata, sp. nov.

Head black, densely gray pruinose, first two joints of antennae black, the remainder brownish, the sutures yellow; flagellar joints elongate oval, towards apex of antennae becoming almost cylindrical, each much longer than broad and bearing a whorl of bristles; mouth parts black; body black, subopaque, thinly grayish pruinose, a spot above each front coxa and the genitalia, yellowish; coxae and base of femora yellow, remainder of femora brown; tibiae and base of tarsi yellow, apices of tarsi brown; halteres yellow, the knobs brown; wings hyaline, the apices and hind margins pale gray, costal cell brown, stigma dark brown; auxiliary vein curving toward the first and ending in it noticeably before base of first submarginal cell, a crossvein situated considerably before the apex of the auxiliary vein connects it with the costa; marginal crossvein close to apex of first vein and near middle of upper branch of the second, petiole of first submarginal cell shorter than the great crossvein, the latter near middle of discal cell, five posterior cells, the second subequal in length to its petiole, no supernumerary crossveins: length, 9 mm.

A female specimen. Type No. 5318, U. S. Nat. Museum.

Tabanus rhombicus O. S. This species was originally described from the mountains of Colorado.

Cyrtopogon callipedilus Loew. Hitherto recorded from northern California and Wyoming.

Empis poplitea Loew. Originally described from Alaska, and also occurring in Colorado.

Syrphus arcuatus Fallen. A European species which also occurs over the greater part of North America north of Virginia and Mexico.

Syrphus creper Snow. Originally described from the mountains of Colorado and New Mexico.

Chrysotoxum derivatum Walker. Extends from Kansas and New Mexico westward to the ocean and northward into British America.

Volucella facialis Williston. Hitherto known to occur in Colorado, Washington and Alaska.

Arctophila flagrans Osten Sacken. Occurs in New Mexico, Colorado and Alaska.

Eristalis hirtus Loew. Has been recorded as occurring from Kansas and New Mexico northwestwardly to Washington.

Helophilus dychei Williston. Heretofore recorded only from Alaska.

Gonia capitata De Geer. A European species which also occurs over the greater part of this country, from Canada to Mexico.

Peleteria aenea Staeger. A European species which has also been recorded from Greenland, Idaho, Wyoming and Colorado.

Echinomyia hystricosa Williston. Occurs from New Mexico and Arizona northwardly to Idaho and Washington.

Calliphora vomitoria Linné. A European species which also occurs over the greater portion of North America.

Phormia regina Meigen. Also a European species which has about the same distribution as the preceding species.

Hyetodesia brunneinervis Stein. Heretofore known only from Idaho and Alaska.

Hyetodesia rufitibia Stein. Has been recorded from Pennsylvania, Georgia, Illinois and Kansas.

Pegomyia costalis Stein. Described from South Dakota, and also occurs in Alaska.

Phorbia platura Meigen. A European species which has hitherto been reported as occurring over the greater part of the United States east of Idaho and Kansas, and also in Canada.

COLEOPTERA.

BY H. F. WICKHAM.

Carabus taedatus Fabr. var. *oregonensis* Lec. This form is tolerably common in the Rocky Mountains from Colorado to the British territories and reaches the Pacific coast in the northern portion of its range.

Bembidium incertum Mots. Not uncommon in the high Rockies (Leadville, the Argentine Pass road above Georgetown, Colorado). Also from mountains above Donald, B. C., and from Crow's Nest Pass. It occurs in the Lake regions at Marquette, Mich., and Bayfield, Wis., and in Nevada as well as along the Pacific coast from Alaska to California.

Pterostichus iuczotii Dej. Widely distributed in the northern part of the continent, common in the mountains of Colorado.

Amara brunnipennis Dej. Found in Labrador, the White Mountains, and on high peaks (above timber line) in Colorado.

Amara remotestriata Dej. Extremely abundant in the mountainous regions of New Mexico and Colorado, also in Eastern Washington, Idaho and Montana, less common farther East (Iowa, Kansas, Nebraska to Texas and Canada). Northern portions of Europe and of Asia.

Chlænius sericeus Forst. "Occurs everywhere in the United States and Canada" (Horn).

Hippodamia convergens Guer. Also found over the greater portion of the United States and in Canada.

Cytilus trivittatus Melsh. The United States north of Pennsylvania, westward to Idaho, common in Canada and in the higher Rocky Mountains of Colorado.

Athous cribratus Lec. Previously known from New Mexico (Taos Peak) and southern Colorado. A second specimen, differing in form of thorax, I refer with some doubt to the ♀ of the above, the sexes of Athous often being unlike.

Aphodius anthracinus Lec. Utah (American Fork Canon); Colorado (above Ouray, 9000–10000 ft.).

Leptura propinqua Bland. Western Canada, northern U. S. from Montana to the Pacific; Nevada, New Mexico, Arizona. Common in the mountains of Colorado.

Leptura nigrolineata Bland. Colorado (South Park, Leadville, Ouray and the adjacent mountains up to about 10,000 feet).

Syneta carinata Mann. "Alaska, Idaho, Utah" (Horn). One in my collection is from the mountains of British Columbia, above the town of Donald.

Diabrotica tricincta Say. Colorado Springs and other points in Colorado, extends southward to Mexico. Not confined to the mountains.

Luperodes morrissonii Jac. "Southern California and Arizona." (Horn). Not quite typical, but according to the description very nearly so.

Galeruca externa Say. "Kansas, Utah, Nevada, Oregon, Washington, Idaho" (Horn). In my collection from Manitoba; California; Williams, Arizona; and several points in the mountains of Colorado (Leadville, Breckenridge, the Argentine Road, mountains above Ouray). I also have one from Glenora on the Stikine River in northern British Columbia.

Cantharis nuttalli Say. Winnipeg, Manitoba; Dakotas, Montana, various localities in Colorado; New Mexico.

Trichalophus alternatus Say. Not unfrequently met with in the mountains of Colorado. I have it from Breckenridge, Leadville, Red Cliff and the Argentine Pass road, also from Laramie, Wyoming.

Stephanocleonus cristatus Lec. Winnipeg, Manitoba; Leadville, Colorado.

NOTES ON MACROPSIS AND AGALLIA (JASSIDAE).

BY C. F. BAKER, ST. LOUIS, MO.

The article on these two genera in the November PSYCHE, calls for notice from me and I add further notes on the subject with great willingness, especially as this case illustrates very well indeed the very detrimental effect of a common trouble among American workers, viz.: a lack of coöperation, be it generous or otherwise. I can only say that I am ready, as I have always been, to do anything in my power, regardless of all other considerations, to prevent such occurrences as this in connection with Macropsis and Agallia.

However, once in print, statements and descriptions cannot be withdrawn, much as we would like sometimes.

I drafted the descriptions of my new species of Agallia and Macropsis mentioned, some three years before they were printed and they were sent out for publication over two years before they finally appeared. I certainly was not aware of any paper having been published by Osborn and Ball on the subject, for none had been. And finally I did not hear of nor see the paper by Osborn and Ball until it was too late to withdraw my own.

If the types of *Agallia mexicana* fit exactly the description of *modesta* there can be no question of the synonymy. I followed my own "elaborate directions" and saw the female last ventral segment "slightly concave," though this would be no specific difference. The same is true of my species *heydei* and *producta*. Mr. Ball criticises me for describing from a single specimen, though on the same page he does likewise. Doubtless the "yellow saddle" is likewise a "result of accident or imperfect development," especially when we consider that the Agallias are quite variable in color. The name *reticulata* was long ago preoccupied in European literature. If this species is distinct from any of Uhler's it may be known as *ballii*. Mr. Ball should certainly state his grounds for reducing *inconspicua*, especially if it was based on an examination of the type.

I have no doubt whatever that *peregrinans* is a composite species, impossible of determination except through examination of the types. Any one of a half dozen North American and fifteen or twenty South American species would answer the description equally well. The types are credited to "Insulae Taiti et Oahu, California, Rio Janeiro; var. e Rio Janeiro." Osborn and Ball expressed doubt as to their own determination of it. Not having examined the types this doubt is a very laudable one. In any event the Sandwich Island form retains the name and *lyrata* cannot be reduced as a synonym of it. This is another "sad commentary on the accuracy" of Osborn and Ball's synonymical work.

Fowler's account of Macropsis had not been distributed when I sent out my paper, nor had Osborn and Ball's paper appeared. Mr. Ball here again mentions my "very meager" amount of material. I fail to see the point of this when the number of specimens averages as large as for many of his own species. The last ventral segment of female in *alabamensis* was described as three lobed, in *apicalis* this is said to be rounding or two lobed. As to the correctness of Mr. Ball's determination of *misella* (not "*missella*") I cannot say, not having seen the specimens. I can only say that the types of *rufoscutellatus* do not fit the description of *misella* — and this most decidedly. I cannot account for such a reference as this, and on so uncertain and ill-founded a basis.

Mr. Ball's guess concerning *magnus* as a form of *californicus* may possibly be correct. I guessed the same before describing them. However I had no proofs to bear me out, nor has Mr. Ball submitted any. If they did not represent species they certainly would varieties. Mr. Ball does not even allow them varietal standing, but in the same breath bases a "var. nov." on specimens of *laeta* "suffused with reddish." This reddish suffusion is a character not uncommon among various other Jassids. The reference of these species to *humilis* is wholly the most superficial guesswork. It is needless to say that the word "pronotum" in the fourth line of the description of *magnus* is a missprint for "elytra."

The species *idioceroides* does belong in the genus Macropsis as it is at present defined. Mr. Ball might just as well separate it as a new genus. It would be just as good a one as many others in the Jassidae.

COCCIDAE OF THE HARVARD BOTANICAL GARDENS.

BY GEO. B. KING, LAWRENCE, MASS.

The following is the result of two brief visits to the Harvard Botanical Gardens at Cambridge, Mass. The first was on July 15 of this year, in company with Mr. A. F. Perry. Just two hours' work was put in at this time. The next visit was by myself on August 13; about three hours were spent about the garden and greenhouses. Although we found a large number of coccids to inhabit this beautiful garden, we have by no means got all that really exist there. Other visits are contemplated and it should be said that a splendid opportunity presents itself here for students to study the life history of many interesting and injurious coccids. Several species are here cited for the first time, together with many new food plants, which adds considerably to our Massachusetts list.

1. *Lecanium pruinosum* Comst. MS., Coq. were found on *Prunus domestica*, var. *Bradshawi*, recorded here for the first time from Mass. The food plant is also new.

2. *Lecanium quercitronis* Fitch. on *Xanthoxylum americanum* a new food plant for this scale.

3. *Lecanium longulum* Dougl. on *Monstera deliciosa*, in the tropical greenhouse. This scale is of recent introduction, and new to Mass.; the food plant is also new.

4. *Lecanium melaleucae* Mask. on the same plant as the latter in the tropical greenhouse, and is of recent introduction

and new to North America. The food plant is also new for this scale.

5. *Lecanium hemisphaericum* Targ. on a fern (*Nephrolepis tuberosa*), and a vine, in the greenhouse. These food plants are new.

6. *Lecanium oleae* Bern. on a small shrub out of doors, and is new to Mass.

7. *Lecanium* sp., very much like *L. oleae*, but not that species; only two found, and not sufficient for study; was found on *Cycas revoluta*, in the greenhouse.

8. *Lecanium tessellatum* Sign. This was the most prolific species met with, on the following greenhouse plants, Palms: *Chamaerops Martiana*, *Rhopis flabelliformis*, *Phoenix Ousleyana*, *P. reclinata*, *P. paludosa*, *Areca Alicae*, *Rhopalostylis Baueri*, *Caryota urens*, *Kentia Forsteriana*, *K. Wendlandiana*, *Chamaerops Fortunei*, *Hyophorbe Verschaffelti*, *Astrocaryum mexicanum*, *Arenga Wightii;* other plants: *Monstera deliciosa*, and *Gartnera racemosa.* These are all new food plants.

9. *Lecanium fletcheri* Ckll., on *Thuja occidentalis*, var. This species was described from Ottawa, Canada, in 1893. In February of this year I received some scales on *T. occidentalis* from Vienna, marked "new species." Upon examination, however, they prove to be *L. fletcheri* Ckll., identical with those which I received from Dr. Fletcher.

10. *Pulvinaria innumerabilis* Rathv., on *Aesculus flava*, a new food plant.

11. *Aspidiotus rapax* Comst., on *Coprosma Baueriana.* New to Mass.; the food plant is also new.

12. *Hemichionaspis aspidistrae* Sign., on *Davallia moorei*, a fern in the greenhouse. The coccid is new to Mass.

13. *Mytilaspis ulmi* L., on *Syringa persica*, a new food plant.

14. *Aulacaspis elegans* Leon., on *Cycas revoluta*, in the greenhouse.

15. *Aulacaspis rosae*, on *Rosa lucida.*

16. *Dactylopius citri* Risso, on *Callistemon lanceolatus*, a new food plant.

17. *Dactylopius longispinus* Targ., on *Nephrodium amplum*, in the greenhouse.

18. *Dactylopius nipae* Mask., on an unknown plant in the tropical greenhouse. This is new to America.

19. *Diaspis minima* Targ., on *Biota* (*Thuja*) *orientalis*, from China. The coccid is new to America.

There yet remain a few more species not yet determined, which will be published in a subsequent article. For a list of scale insects previously recorded from the Harvard Botanical Gardens, see Canadian Entomologist, 1899, pp. 140, 227, 227, 228, 229, 252, and for those recorded from Cambridge other than the above and might perhaps have been found in the greenhouse of the Botanical Garden, see the same journal, 1899, pp. 109, 139, and 140.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XVIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Haematopis grataria Fab. Riley has described the mature larva and pupa and given a short account of the habits, which has been quoted by Packard.

Egg. Laid in a row side by side on the edge of a leaf or stem. Elliptical, flattened above and below, wedge shaped, the larger end moderately truncate; marked like a thimble all over, the reticulations broad and rounded, the cell areas depressed, forming rounded shallow pits. The pores at the angles of the reticulations show in certain lights as white dots. Pale yellow, later turning red. Size .6 × .4 × .3 mm.

Stage I. Head rounded, slightly bilobed, erect, free, dull black, the face whitish, irregularly bordered, looking like four confluent patches about the clypeus; antennae small; width about .25 mm. Body moderate, normal; white, a little sordid; a broad red-brown subdorsal band, becoming, behind joint 5, a broad single dorsal band, cut on each segment by a posterior cuneiform patch of the ground color dorsally and a small anterior one subdorsally on each segment. A similar broad subventral band, more diffuse and a little paler, the pair obscurely joining in the centers of the medial segments. Tubercles small, dark; setae short, slightly enlarged at tips; shields uncornified, concolorous; feet pale.

Stage II. Head squarish bilobed, a distinct shallow vertical notch; free, higher than joint 2; brown mottled, a white patch across the lower part of clypeus, a yellowish white vertical band and broader, irregularly edged patch behind the ocelli; width .35 mm. Body somewhat thick, the segments slightly enlarged centrally and a little angularly bent, subannulate, tubercles and setae obsolete. Greenish white, marked with dark reddish brown. At the ends a broad subdorsal band, obscurely geminate, becoming centrally a series of large V-marks, one on a segment, the points directed forward, joined by narrow addorsal and subdorsal lines, in all five such marks, situated on joints 5 to 9. Sides slightly marked with olivaceous in the folds. A broad subventral band, obscurely darker, running the whole length and partly olivaceous, not so sharply defined as the dorsal marks. Feet pale outwardly. A dark lateral shade on joint 5.

Stage III. Head as before, the brown color darkened, spotted, the light color yellowish-white; width .55 mm. Body yellowish white in ground, but largely obscured. Subdorsal line pale brown, sharply, though a little pulverulently edged, continuous, obscurely cutting the oblique, velvety brown bars of joints 5 to 9, into which the former V-marks are now divided. Lateral band velvety brown, representing the oblique bars at the extremities. A faint, geminate, pale brown, stigmatal band, composed mostly of the prolongations posteriorly of the oblique bars, but a true line at the extremities. Subventral band broad, pulverulently geminate, dark brown, widened above centrally on the segments, especially on joint 5, where it forms a large spot. Feet pale outwardly. Tubercles and setae obsolete. Body moderate, rather robust, the segments slightly swollen centrally.

Stage IV. Head rounded, squarish above, broad, lobes full at cheeks, held obliquely, free from and higher than joint 2; densely dotted with blackish brown, leaving a small white vertical streak on the lobe and a space behind the ocelli, the latter reticulate; width .8 mm. Body moderate, a little tapering before, not so behind, marked as before, but the brown marks darker and more extensive so that this color predominates, making the larva look brown with greenish white lines, of which the central obliques, bordering the oblique brown patches below and that on the subventral fold are most distinct. Dorsal line obscurely geminate, pale.

Stage V. Head as before; width 1.25 mm. Body also as before, moderate, cylindrical, thorax and central abdominal incisures smaller, anal plate rounded, a little projecting, anal feet thickly triangular. Heavily mottled with black brown; dorsal line obscurely geminate, lighter brown; subdorsal obliques from subdorsum anteriorly to spiracle on joints 6 to 9, yellowish white, broken; a similarly colored, longitudinal, broken stigmatal and subventral line, two faint lines in subventral space and a distinct medioventral one, all somewhat pulverulent and brown dotted. Feet dark, the anal ones only pale outwardly. When disturbed the larvae fall and remain motionless extended straightly. Cocoon a large delicate net in which the pupa is suspended. Many brooded; larvae from Washington, D. C. They fed readily on *Polygonum rayi* and were raised on this plant.

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PSYCHE.

THE DISTRIBUTION OF HOLARCTIC COLLEMBOLA.

BY JUSTUS WATSON FOLSOM, CHAMPAIGN, ILL.

[Annual address of the retiring president of the Cambridge Entomological Club, January 11, 1901.]

No less than one hundred and fifty-two species of Collembola are known to occur in North America, of which thirty-eight, at least, are shared with Europe. Their specific identity has been established, not simply from descriptions, but by a thorough comparison of specimens. Twenty-five per cent of the Nearctic species, then, are also Palaearctic. Specimens of the latter, as a rule, average slightly larger than of the former, but that is all.

I doubt if as large a proportion of Holarctic species is recorded for any other order of animals; moreover, this proportion is increasing, with the comparison of additional specimens.

Apparently restricted to the eastern part of the United States are several species which may have been recently introduced; such are *Neanura muscorum*, *Aphorura armata*, *Orchesella cincta*, *Sira buski*, *Tomocerus vulgaris* and *tridentiferus*.

The following occur abundantly throughout Europe and the United States: *Aphorura inermis*, *Podura aquatica*, *Achorutes armatus*, *Isotoma fimetaria*, *viridis* and *palustris*, also *Entomobrya multifasciata*. These are the more obtrusive members of the order and, having been widely collected, furnish valuable data for the study of distribution. The list will doubtless be increased when more is known about the Collembola of the western states; as it is, the forms next named, which range throughout Europe, are known to occur in most of the States east of the Rocky Mountains: *Anurida granaria*, *Isotoma cinerea*, *Lepidocyrtus cyaneus*, *Sira nigromaculata*, *Sminthurus aquaticus*, *malmgreni*, *hortensis* and *elegans*.

In the arctic regions the less specialized Collembola flourish, some species becoming larger than in middle Europe. Thanks to several expeditions, our knowledge of the arctic range of many species is definite. Of the sixty known species of arctic and subarctic Collembola, at least twenty are broadly distributed in the United States, and all but a few occur in northern and middle Europe; in fact, but three or four are peculiar to the arctic region.

In Greenland, Spitzbergen, Franz

Josef Land, Nova Zembla, Siberia and Alaska are found many of the species common to Europe and the United States, for example, *Neanura muscorum*, *Anurida granaria*, *Achorutes armatus*, *Isotoma palustris* and *viridis*. Hitherto, *Tomocerus niger* of Europe, *T. arcticus* of Siberia and *T. americanus* of California have been regarded as distinct species. The Harriman expedition, however, brought from Alaska numerous specimens which form perfect intergradations between the three forms named.

There is, then, not only a remarkable agreement in structure between European and North American Collembola, but also, for many species, continuity of distribution.

The specific identity of so many Holarctic species, an identity which would not be expected upon *a priori* grounds, may easily be accounted for. The Collembola and Thysanura, the most generalized of hexapods, present very few adaptive characters as contrasted with other insects. The Collembola feed upon organic debris and are mostly confined to moist and decaying vegetable matter or to water surfaces. Like the worms, the simplicity of their external organization is to be attributed to the uniformity of their environment. The simple conditions of food, moisture, temperature, etc., which a Collembolan requires, may be found almost anywhere in the Holarctic region; so that, after all, it is difficult to understand how, under such circumstances, any decided modification of even varietal value could occur. The species of continuous Holarctic distribution are, in every case, only such as can exist in a comparatively simple environment, — the more specialized species and genera are not found to any extent in the arctic region.

The wide distribution of Collembola is surprising, for they appear to have no means of self dispersal; they lack wings and probably always did, as none are found in the embryo; their feeble walking and leaping could procure only a limited local distribution; a dry spot is an effective barrier to most Collembola, which require an atmosphere saturated with moisture. The insects may possibly be blown about to some extent, but their eggs are probably not, as they are laid in the soil, under bark, or in other concealed places.

As for accidental means of dispersal, there may be many. Several species not indigenous have been found in greenhouses among exotic plants. *Isotoma fimetaria*, abundant in rich soil, frequently occurs on potted plants. I used to find *Entomobrya multifasciata* and other species among early strawberries which had been brought to Massachusetts from the south. The influence of man, then, in transporting Collembola upon plants, fruits or vegetables is not inconsiderable.

The lower animals perhaps assist now and then. Moniez found a species of Entomobrya by hundreds in the fresh nest of a finch, where they were feeding upon the lining of feathers; Wahlgren records three species of Collembola from the mossy nests of sea gulls; whether birds carry these insects among their feathers, or not, is not known. Mr. S. R. Williams gave me a specimen of *Entomobrya griseo-olivata* and a Thrips both of which he found deep in the fur of a mole.

These accidental, or occasional, means of dispersion may be recognized without being assigned too much importance. Certainly, human intervention cannot be held responsible for the distribution of the arctic forms by which the European and North American faunae are linked together.

By far the most important agent of dispersion is running water. During most of the year, some species of Collembola are to be found on our streams and ponds and, in some months, as many as a dozen kinds at once. A few of these, such as *Podura aquatica*, *Isotoma palustris*, *Sminthurus aquaticus*, *malmgreni* and *spinatus* possess structural adaptations for their semiaquatic life, but many other species are met with which, though normally terrestrial, are quite at home on the surface of fresh water, which cannot wet them, and in which they cannot sink; they leap upon the surface film with ease.

Such species undoubtedly owe their broad distribution mainly to streams of fresh water.

The snow fleas, which attract interest by their sudden appearance in immense numbers, are distributed by the same means. In the latter part of winter they may be found, more or less benumbed, under the loose bark of trees, especially pine, oak and maple, or else about the roots among dead leaves, in which situations their eggs are laid. Rendered active by the first warmth of spring, the little creatures wander out and sometimes darken the snow by their numbers. Rivulets of melted snow or of rain water carry them to the brooks whence they are borne to the rivers and scattered no one knows how far.

Many other species are washed from stream to stream in the same way; floating logs, branches and roots must often transport Collembola, especially of the genus Isotoma, a large proportion of which live under loose bark. In fact, I believe that the most important agents of dispersion for inland Collembola are fresh water streams.

Marine currents, also, are of vast importance in this respect. Wahlgren records nine species of Collembola from barren rocky islands off the Swedish coast and properly maintains that they were distributed solely by sea water. These are *Anurida maritima* and *tullbergi*, *Anurophorus laricis*, *Xenylla maritima* and *humicola*, *Achorutes viaticus*, *Isotoma viridis*, *Entomobrya lanuginosa* and *Sira buski*.

It is a significant fact that almost all those named are Holarctic.

The species of Anurida, indeed, are restricted to salt water. *A. maritima* is common on the coast of Massachusetts, where it occurs in colonies between tide marks. At low tide the insects walk about and feed upon dead mollusks; as the tide rises they hide under stones and become submerged.

Now this species occurs not only on the coasts of New England, Long Island, Florida, and probably of intervening places, but also along the entire western coast of Europe; its distribution by marine currents, therefore, cannot be doubted.

Isotoma besselsi, a marine species found first at Polaris Bay, is not rare on the coast of Massachusetts and has lately been found in Spitzbergen. *Xenylla humicola* has a similar distribution.

Achorutes tullbergi (*dubius* Tull.) inhabits Siberia, Nova Zembla, Franz Josef Land and Spitzbergen, and also occurs on the salt marshes of eastern Massachusetts.

Achorutes viaticus not only ranges over the Palaearctic region, including the arctic islands, but has been found in California and even in Tierra del Fuego.

Finally, *Achorutes armatus*, which occurs throughout the Holarctic region, has been taken in South America, New Zealand and Sumatra.

More cosmopolitan forms are known, but none of the other faunal regions share their species to the extent to which the Palaearctic and Nearctic do.

I have shown that a number of generalized species of Collembola inhabiting both Europe and the United States are practically continuous in their distribution between the two places. The fact, however, that most Holarctic species are discontinuous must be accounted for and the explanation of the fact is important for its general bearing.

Nearly all the Holarctic species of the Arctic regions proper belong to the most generalized families, i. e., Aphoruridae and Poduridae, and can live in an environment of extreme simplicity and rigor, needing but the scantiest of vegetation and being quite tolerant of cold; in temperate regions they are noticeably the most active species of the order during the winter.

The Entomobryidae and Sminthuridae, on the other hand, require more warmth and certainly a more luxuriant vegetation than arctic regions afford. Now these most specialized families, adapted to a more complex environment, contain many species which, although identical in middle Europe and the United States, do not exist, it may safely be said, in the intervening regions, where, most probably, they formerly must have occurred. The inference is obvious, then, that a higher temperature and a more luxuriant vegetation than at present once prevailed in the arctic zone. This is no news, of course,— but the additional evidence is worth something.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.— III.

HYMENOPTERA APOIDEA.

BY T. D. A. COCKERELL.

Bombus proximus Cresson.

Abundant.

B. proximus var. *howardi* (Cress.)

A few flying with the typical form.

B. ternarius Say.

1 ♀.

B. juxtus Cress.

2 ♂, 1 ♀.

B. frigidus Smith.

1 ♀. New to New Mexico. Originally described from "Arctic America; Hudson's Bay." It is also known from Great Slave Lake, Yukon River, Vancouver I., and the high mountains of Colorado. It has the closest possible resemblance to *B. derhamellus* Kirby, which I have from Innsbruck in the Tirol, collected by Mr. Friese. I believe that the *B. derhamellus* reported by Kirby from Arctic America (Lat. 65°) must have been *frigidus*. When in Philadelphia last year I saw Cresson's types of *B. putnami* and *couperi*, and it seems to be an open question whether they are really separate from one another and from *frigidus*; but it will be necessary to make a careful study of more abundant material than has yet been available, to precisely fix the status of these forms.

Megachile wootoni Ckll.

1 ♂. Belongs to a circumpolar group, *Megachile*, s. str.

Halictoides (Parahalictoides) maurus (Cresson).

1 ♂. New to New Mexico.

Panurginus bakeri (Ckll.).

1 ♂ at flowers of *Potentilla* (*Dasiphora*) *fruticosa*. New to New Mexico.

P. cressoniellus Ckll.

2 ♀, one at flowers of *Potentilla fruticosa*.

P. verus, n. sp.

1 ♀. Length 8 mm., entirely shining black, even to the tarsi and flagellum; head, thorax, legs and apex of abdomen with rather long white hair, that on the hind legs carrying some orange pollen; antennae reaching the tegulae; face and clypeus with large sparse punctures; front minutely striated, with small close punctures; mesothorax closely punctured at the sides, sparsely in the middle; first segment of abdomen shining, with minute sparse punctures; following segments minutely sculptured, with closer small punctures; tegulae shining piceous; wings slightly dusky, stigma and nervures black; *marginal cell broadly obliquely truncate at the end*, appendiculate; first submarginal cell more than twice as large as second; *first recurrent nervure joining first submarginal cell well before its end;* second recurrent joining second submarginal cell just before its end.

This is a very interesting species, being a true *Panurginus* of the type predominant in Europe and Asia. It apparently comes nearest to *P. punctiventris* and *P. alticola* from the Caucasus, and *P. montanus* from the Alps. I have before me a specimen of *P. montanus* collected by Mr. Friese at Innsbruck, at flowers of *Ranunculus*, and it resembles *verus* so closely that upon superficial examination it could easily be mistaken for it; however, the first recurrent nervure in *montanus* is interstitial with the second transverso-cubital, and the marginal cell is bent where it leaves the costa, whereas in *verus* it is only curved.

Andrena apacheorum Ckll.

1 ♀.

Halictus peraltus, n. sp.

1 ♂. Length hardly 7 mm.; black; the broad anterior margin of the clypeus, and the labrum (but not the mandibles) lemon yellow; flagellum beneath, except at the extreme apex, pale chrome yellow; knees, anterior tibiae in front, and hind and middle tibiae narrowly at apex, pale yellow; tarsi very pale yellow, the last joint of the middle and hind tarsi dark brown; tubercles wholly black; tegulae shining piceous; wings hyaline, nervures and stigma very dark brown. Face elongate, clypeus produced, clypeus and sides of face covered with appressed shining white hair; vertex rough; scape short, flagellum stout and very long; mesothorax dull, minutely roughened and with close punctures; enclosure of metathorax large, with numerous longitudinal ridges connected by small transverse ones; first segment of abdomen shining, with minute sparse punctures; following segments minutely sculptured so as to have a satiny lustre.

Differs from *H. arcuatus* ♂ by the color of the antennae and other characters; from *H. similis* ♂ by the color of the nervures, entirely black tubercles, etc. The second recurrent nervure enters the third submarginal cell at least two-fifths from its end, the lower apical angles of the cell being produced, very differently from *arcuatus* and various related species, such as *olympiae* and *kincaidii*.

LEPIDOPTERA HETEROCERA (part)

BY H. G. DYAR.

Clisiocampa fragilis Str.

Nemeophila petrosa Wk. *var geometrica* Grt.

Crocota aurantiaca Hbn. *var brevicornis* Walk.

Crambus dumetellus Hbn.

Loxostege sticticalis L.

Tortrix fumiferana Cl.

Stenoptilia exclamationis Wals. (?) Really too poor for certain determination, but agreeing with others (equally poor) from Colorado (Bruce) which Prof. Fernald thought might be *exclamationis*, originally described from the mountains of California.

RHYNCHOTA HETEROPTERA.

BY HERBERT OSBORN.

Nysius thymi Wolff. Slightly more opaque in elytra than usual.

Lygaeus reclivatus Say.

Harmostes reflexulus Say.

Thyanta custator Fab.

Leptopterna amoena Uhler.

Camptobrochis ? sp.

This species seems to come properly in this genus, and near *grandis* but differs from my specimens in being much darker and the head is not nearly so vertical.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XIX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Senelys ennucleata Guen. The larva given by Guenée as that of this species does not agree at all with my observations. On the other hand, the one described by Goodell does agree well. As it seemed possible that there had been some mixture of species, I applied to Dr. Hulst, who states that he thinks the two forms of the moth probably distinct, as follows:—

1. Wings sordid white with faint brownish lines—
   ENNUCLEATA Guen., Phal. i, 505; 1857. =*restrictata* Walk. C. B. M. xxii, 722; 1861 = *mensurata* Walk. C. B. M. xxxv, 1621; 1866.
2. Wings with a more or less extensive blackish submarginal powdering—
   ALABASTARIA Hübn. Zutr. ii, 22, fig. 311, 312. = *ennucleata* var. Guen. Phal. pl. 12, fig. 3. = *ennucleata* Pack (nec Guen.) Mon. 347, pl. 10, fig. 67. = *reconditaria* Walk. C. B. M. xxii, 786, 1861.

The moths bred from the larvae here described were of the form *ennucleata* as defined.

Egg. Laid loosely, rolled about in the tumbler. Roundedly elliptical, one diameter less than the other, but without flattened areas, slightly more sharply rounded at the micropylar end; about 15 longitudinal, strongly prominent ribs with fine parallel cross-striae, slightly raised both across the ribs and in the interspaces. Ends confused reticulate, the ribs abruptly ending at the edge of the micropylar end, becoming merged in the reticulations at the other. Very pale green, almost white, not shining. Size .55 × .4 × .35 mm. (Eggs from Washington, D. C.)

Stage I. Long, slender, thread-like, actively looping. Head and cervical shield pale translucent reddish brown, the head round, slightly bilobed, ocelli black; width about .3 mm. Body dark brown above and below; the sides broadly translucent greenish. Thoracic feet pale, abdominal ones dark. Setae short and stiff, black, with swollen clearer tips. Later the subventral brown breaks up into a series of subventral streaks. The larvae remain long and slender.

Stage II. Head round, flattened before, not bilobed; width .4 mm. Body slender, the thorax short; smooth; ground color translucent sordid whitish, thorax with fine dark brown subdorsal line and a broader subventral one; abdomen with broad dorsal brown band tapering to a point on joint 13, leaving the sides and feet pale; a moderately broad subventral band, broken posteriorly.

Stage III. Head round, wider than high, antennae prominent; pale brown, dotted, a white streak on the face of each lobe edged with darker brown dots; width .6 mm. Body long and slender, cylindrical, smooth. Somewhat sordid green; thorax with a fine dorsal line which joins the broad abdominal dorsal band, reaching joint 3, contracted slightly at the incisures; a series of small round segmental spots subventrally, a line on the anterior edge of the foot of joint 10 and bases of thoracic feet dark purple brown. Setae short and stiff, dark. Skin finely transversely creased. Anal feet long, green. Tubercle i of head and angles of cervical shield a little prominent.

Stage IV. Head rounded, squarish, dull yellowish, speckled with brown; a bright shade, edged with brown without, on the face of each lobe; width .75 mm. Body very long and slender, finely annulated, dull brownish yellow; dorsal line faint and obscure, scarcely darker than the ground except dorsally on joints 10 to 13, where it is dark and distinct, its border marked by dark dots intersegmentally (approximate), and centrally on the segments (remote). Thorax darkly shaded, the lines obsolescent. Venter a shade paler with series of subventral brown dashes edging the bases of the feet. Setae short, dark; tubercles obsolete; skin granular. Later a heavy black shade overspreads the posterior two-thirds of the venter, especially posteriorly, reaching the sides and finally the dorsum of joint 13 in one larva, but leaving the feet pale outwardly. Otherwise the larva is uniformly brown, finely annulate, the few dark brown dots obscure. Some of the larvae passed another molt about Sept. 14 with width of head .9 mm., and the same coloration; but most hibernated in this stage. They began feeding again April 30.

Stage V. Head rounded, rather strongly bilobed, ashen on the face, brown flecked, a broad diffuse band on each side of the median suture and a longer parallel one up each lobe before the ocelli to vertex; width 1.1 mm. Body ochraceous brown, shaded with black ventrally on joints 9 to 13, feet pale outwardly. Segments about 30-annulate. Traces of brown dorsal and subdorsal lines and black flecks near the incisures; also blackish shaded laterally posteriorly on the segments. Spiracles black; vi on a low rounded lump, most distinct on joints 5 and 6. Tubercles minute, setae short, black.

Stage VI. Head somewhat squarely rounded, free; whitish gray, mottled with brown, a broad, diffuse, mottled dark stripe from behind ocelli and a shorter one each side of median suture; width 1.6 mm. Segments about 30-annulate, cylindrical, uniform, slender, well drawn out; anal feet projecting laterally, the plate broad rounded at the end; shields all concolorous. Wood brown, ochraceous dorsally on joints 3 to 13, a diffuse red-brown dorsal line, becoming a bluish white bar on the large first annulet. Black crinkly addorsal dashes anteriorly and posteriorly on each segment, the posterior ones a little more lateral and a little oblique. A diffuse, sparsely pulverulent, black stigmatal and subventral shading, heaviest and covering most of the venter of joints 8 to 10, but leaving the foot of joint 10 outwardly pale. Venter sparsely black irrorate. Thoracic feet pale. Spiracles black; tubercles and setae minute.

Larvae handed me by Mr. W. D. Kearfott from his collecting box, where they had hatched in July; moth the following June. Single brooded, hibernation in Stage IV. The larvae were raised on wild cherry and apple.

Food of larvae of Simulium and Blepharocera.— In making sections of the larvae of Simulium and Blepharocera, in a study of the post embryonic development of these flies, I have found a peculiar obstacle in the presence in the alimentary canal of hundreds of the tiny silicious shells of diatoms. From an examination of the alimentary canal of many specimens of Simulium and Blepharocera it is apparent that diatoms constitute a large part of the food of these larvae, both of which live clinging to the smooth rock beds of swiftly flowing streams. I have mentioned, in a paper in the Entomological News (January, 1900) the curious fact that the fully grown larvae of *Blepharocera capitata* are covered dorsally with a close growth of diatoms. The most abundant diatom in this growth was one of the stalked Gomphonema. The basis of this covering of the larva's back was the gelatinous mass at the base of the stalked diatoms. Scattered upon and through this mass were individuals of Nitzschia and several other diatomaceous genera. The covering had a soft, felt-like appearance, grayish or brownish, and did not seem to trouble the larva. I have found a similar diatomaceous growth on the larvae of Liponeura and two other Blepharocerid species in California. Each larva thus has a roof-garden in which it rears its favorite vegetable! Simulium, on the contrary, seems to have to find its diatoms in the open market.

Vernon L. Kellogg.

THE TRIANGLE SPIDER IN CALIFORNIA.—On November 5, 1898, Professor O. P. Jenkins of this University (Stanford) found a single triangle spider (*Hyptiotes* sp.) on its web in a cedar tree near the University. The web was nine inches long and six inches wide at its base. It had four radii and twenty-two cross threads. At about the same time Dr. Jenkins found a few other webs but was unable to capture any more of the spiders. The spider seems to be the familiar triangle spider of the East, but differs in a number of minor characters and rather markedly in size. Until more specimens are obtained, however, (and in the two years since finding the first no others have been seen) the specific identity of this Hyptiotes cannot be certainly determined.

Vernon L. Kellogg.

PROCEEDINGS OF THE CLUB.

14 December, 1900. The 216th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair.

Mr. W. L. W. Field showed a moth which he had raised from a caterpillar mentioned in the Harris Correspondence and shown on pl. 3, fig. 2. The species is not yet determined.

Mr. A. P. Morse showed specimens of *Dichromorpha viridis* which he had taken at Needham. It had not before been found in eastern Massachusetts.

Mr. S. H. Scudder read a note from Mr. F. H. Sprague, announcing the capture of the same species of grasshopper in a meadow in Milton, Mass., last September. Mr. Scudder also showed a specimen of *Euptoieta claudia*, a rare butterfly in New England, captured at the border of Hartford, Conn., by Mr. S. C. Carpenter; specimens of the European *Mantis religiosa*, reared in Ithaca, N. Y., by Mr. M. V. Slingerland, from eggs received from Rochester, N. Y., where the insect has been in some way introduced, and seems fairly domiciled; a pair of wingless Acridians, recently received from Mr. T. D. A. Cockerell in New Mexico, where they were found upon Larrea, the twigs of which they closely resemble; the species is called *Clematodes larreae* and not only forms a new genus, but represents a new group, allied to certain tropical groups and especially the Vilernae; and finally, a pair of *Cyphoderris monstrosa* Uhl., the male one of the types described from Oregon more than 35 years ago, the female, hitherto unknown, from Laggan, Alberta; the striking difference between the sexes were pointed out.

Mr. R. Hayward showed a record which he had kept during the past summer of the notes of the Katydid with relation to temperature (to appear in PSYCHE).

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IDENTIFICATION OF TWO OF FITCH'S SPECIES, VIZ., DELTOCEPHALUS MELSHEIMERII AND CHLOROTETTIX UNICOLOR.

BY C. P. GILLETTE, FORT COLLINS, COLO.

It was my good fortune the past summer to spend a few days in Albany, N. Y., and while there, was greatly favored by Dr. E. P. Felt, State Entomologist, who kindly allowed me to study the specimens in the box of Fitch types of Homoptera.

It will be remembered that in 1851 Dr. Fitch published a list of the Homoptera of New York State which he entitled a "Catalogue with references and descriptions of the insects collected and arranged for the State Cabinet of Natural History."

The insects upon which the paper was based were given printed numbers ranging between 609 and 874 inclusive, and were placed in the collection of the New York State Cabinet of Natural History in 1850. In 1879, as we are told in Dr. Lintner's Ninth Report as State Entomologist, p. 380, the collection was transferred to the office of the State Entomologist. The case containing the collection is kept hermetically sealed in a dark place and most of the specimens, except for the Aphididae and Typhlocybinae are still in a fair state of preservation. Prior to 1879, museum pests destroyed a considerable number of specimens and the color markings of others have largely faded out.

A label upon the box in Dr. Lintner's hand reads as follows:

"HOMOPTERA

Arranged by Dr. Fitch in 1850: Transferred to this case in 1879. Contains 54 species and 5 subspecies of *types* of Dr. Fitch. See Fourth Report N. Y. State Cabinet N. H., pp. 43--69."

One of my chief objects in examining this collection was to determine whether or not Mr. *Baker is correct in overturning the opinions of other specialists as to the true *Deltocephalus melsheimerii* and *Chlorotettix unicolor* of Fitch, both of which were reported in "Hemiptera of Colorado" (Bulletin 31 of the Experiment Station).

Deltocephalus melsheimerii Fitch. — Although Dr. Fitch speaks of this species as "Common on grass," he described it from a single pair, the male

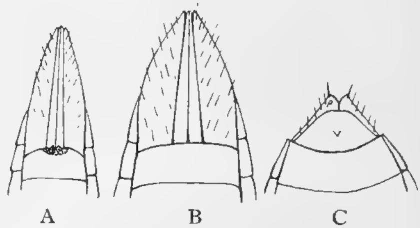
*Psyche, 1897, p. 118 and 1898, p. 219.

of which he numbered 805 and the female 806. The male has been lost but the female, with her original number, still remains and is intact, except for the loss of the tip of one wing cover. In color, it is bleached nearly white, so that the length,—.10 of an inch—given by Dr. Fitch, is all in the description that can now be applied to it.

Mr. Baker, in the first paper referred to above, speaks of having "the original Fitch type"? before him and pronounces it the same as *D. minimus* of Osborn (He should have said Osborn and Ball) and proceeds to condone Prof. Osborn by saying "Still a good description of the genuine *melsheimerii* was much needed."

I had with me type specimens of *D. minimus* O&B and found by careful comparison that there could be no possibility of its being the same as Fitch's *melsheimerii.* Either the supposed type that Mr. Baker studied in the collection of the National Museum is unlike the type that Dr. Fitch placed in the State Cabinet, or Mr. Baker is not familiar with *minimus.* That *minimus* should occur at all in the collection made by Dr. Fitch is *very improbable* as so good a collector as Mr. Van Duzee has never taken it in N. Y. and Dr. Fitch reported *melsheimerii* "Common on grass." Farthermore, *minimus* seems to be distinctively a western species and probably does not occur east of the Mississippi.

The eastern specimens of *melsheimerii* average smaller in size and lighter in color than the western and the type specimen, number 806, does not exceed a large specimen of *minimus* in length. It is readily separated from the latter species by its more robust form and by the entire hind margin of the last ventral segment of the female. In *minimus* the last ventral segment is moderately produced and has upon its hind margin two very distinct teeth as shown in the accompanying figure (A).



A, under surface of the abdomen of *Deltocephalus minimus*, showing the produced last ventral segment of the female with two distinct teeth; B, under surface of the abdomen of the female of *D. melsheimerii* showing the hind margin of the last ventral segment entire and not produced; C, under surface of the end of the abdomen in the male of *D. melsheimerii* ; v, the large valve, p, short podical plates.

After a thorough study of the type, I went into a grass pasture in the suburbs of Albany and collected five females and four males of a species of Deltocephalus that I recognized at once to be like the type and they also proved to be identical with what Mr. Van Duzee had sent me years ago from N. Y. as *D. melsheimerii.* The differences in the genitalia of the males of these two species are even more striking than in the females.

The males of *minimus*, as well as the closely related species, *minkii*, *oculatus*, and *sylvestris*, have the valve relatively small and the plates long, so that the latter project beyond the valve a distance equal to once or twice the length of the valve. *Melsheimerii*, on the other hand, is readily separated from the preceding by its proportionately large valve and very short plates. The latter do not project beyond the valve to a distance more than one third or one half the length of the valve. See the accompanying figure (C).

I must conclude then that *Deltocephalus melsheimerii* is distinct from *D. minimus*; that the references to *D. melsheimerii* in "Hemiptera of Colorado" were correct; and that *D. affinis* G&B is a synonym of *D. melsheimerii.*

Chlorotettix unicolor Fitch.— This species was described from a single female, to which Dr. Fitch gave the number 767. The type is still in a good state of preservation except that it is considerably faded in color.

Mr. Baker in his article on Chlorotettix referred to above reports upon an examination of what he supposes to be a Fitch type in the National Museum and says it is the species described by Mr. Van Duzee as *C. galbinata.* This being correct, the specimens reported in "Hemiptera of Colorado" as *C. unicolor* must be wrong. I compared the type of *unicolor* with *C. galbinata* Van D., and with the Colorado specimens of *C. unicolor* and found Mr. Van Duzee's determinations to be correct and his *galbinata* very distinct from the type of *unicolor.* The descriptions of both these species as given by Mr. Van Duzee in PSYCHE of August, 1892, pp. 308–311 are correct and will enable any one conversant with the gross anatomy of these insects to correctly separate the species without so much as a hand lens to aid him, unless his eyesight is very poor.

INSECTS AND SPIDERS OF THE GALAPAGOS ISLANDS.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CAL.

By the financial aid of Mr. Timothy Hopkins of Menlo Park, California, Stanford University was enabled to send two zoologists with Captain Noyes of the ninety-six ton schooner Julia E. Whalen (San Francisco) to the Galapagos Islands in November, 1898. Mr. Robert Evans Snodgrass, assistant in entomology, and Mr. Edmund Heller, student in zoology, were selected to make the trip. They reached the Archipelago on December 22, 1898, and remained in it until June 23, 1899. In the time of their stay they visited every island of the group except the small island called Jervis, spending from two to sixty days on each island. Some of the larger islands were visited several times. Extensive zoological collections were made especially of birds, reptiles, fishes, spiders and insects. These collections were placed in the hands of specialists for study, and the papers based on the material are being published in the current volume of the Proceedings of the Washington Academy of Science.

The most important invertebrate collections are those of the spiders, the biting bird-lice (Mallophaga) and of long series of the Acridid genera, Schistocerca, Sphingonotus and Halmenus. In addition the insect collections include other Orthoptera, Diptera, Hymenoptera, Lepidoptera, Coleoptera, Hemiptera, Thysanura, Isoptera and Odonata.

The Arachnida, which have been studied by Nathan Banks, include 650 specimens, "by far the largest collection ever made" in these islands, representing 48 species, of which 39 are Araneida, 6 are Arthrogastra and 3 are Acarina. The thirty-nine species of spiders represent fifteen families; twenty-five of these spiders are new species, twenty-one being already known. The collection includes all of the species except two ever taken on these islands. From his study of this collection Banks concludes that the Arachnidan fauna of the Galapagos Islands is more truly related to that of the Central American region than to that of any other portion of the earth. A very valuable part of the paper on these spiders is the extensive ecological notes made by Mr. Snodgrass during his collecting.

The long series of the interesting Galapagos species of Schistocera, Sphingonotus and Halmenus representing all of the islands of the group in which the species are to be found have been carefully studied by Mr. Snodgrass and his interesting conclusions are contained in a paper suggestively entitled "On the varieties of the Orthopterous genera Schistocerca, Sphingonotus and Halmenus on the Galapagos Islands, and a discussion of their inter-relationships, together with a consideration of the relative geological ages of the various islands of the Archipelago." The other Orthoptera comprising twenty-three species have been worked by Prof. Jerome McNeill, who finds seven new species in the collection.

The insects of other orders, except the Mallophaga, have been studied by the specialists of the U. S. Division of Entomology, under the direction of Dr. L. O. Howard. Mr. Coquillet determines twenty-eight species of Diptera representing twenty-three genera, and sixteen families! Of these five species are new; seven are peculiar to, or at least were described from the islands, and all of the remaining sixteen are species known from South or Central America, the West Indies and warmer parts of North America. In the Hemiptera Mr. Heidemann finds twenty-four species of which two are new, and five previously recorded only from the islands. In this collection are two species of the interesting ocean surface genus Halobates. In the other orders a small number of new species is described.

The collection of the Mallophaga is the first made from birds of the Galapagos Islands. Specimens of bird-lice were taken from 183 bird individuals representing thirty-four out of the seventy-nine bird species so far recorded from the Islands. Mallophaga were taken from twenty-six out of the forty-eight bird species and from all of the five bird genera peculiar to the Islands. There is a total of forty-three Mallophagous species represented in the collection, twenty-five of which I have described as new. The problem of the occurrence on the Galapagos birds of previously known species of parasites, and the extraordinary distribution of various Mallophagous species on widely dissimilar bird hosts of the islands make the study of this unique collection of Mallophaga a most interesting one. Little of value in the way of suggestions as to the affinities of the five bird genera peculiar to the islands, drawn from a study of their parasites, can be got at until a better knowledge of the Mallophaga of the birds of the west coast of South and Central America is had. Up to the present no collections of Mallophaga have been studied from the region south of Panama, but such collections are now being made in Bolivia and and Chili, and their examination should offer much of interest in connection with the present Galapagos Island collection.

All the specimens here referred to are now in the entomological collections of Stanford University.

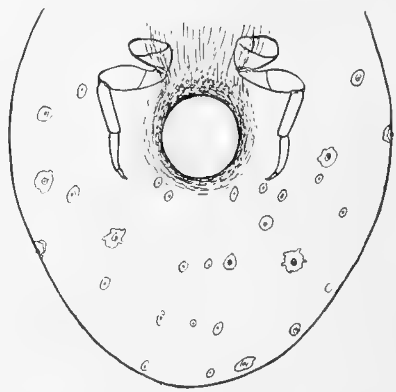
NOTES ON CRYPTICERYA TOWNSENDI CKLL.

BY T. D. A. COCKERELL AND GEO. B. KING.

Crypticerya townsendi was described from specimens collected on the Mescalero Apache reservation, N. M. At the same time a var. *plucheae* was described, from the Mesilla Valley; I am now convinced that this is a valid species, and must be called *Crypticerya plucheae*. The next find of *C. townsendi* was on Gutierrezia at Albuquerque, N. M., by the present writer, in Sept., 1897. So far, the species had only occurred sparingly, and on a single species of plant; but on Aug. 26, 1900, my wife and I found it in great quantity on Goat Mtn., Raton, N. M., living on Compositae of five different genera. The food-plants of *C. townsendi* at Raton were submitted to Prof. E. L. Greene who determined them as follows:—*Townsendia grandiflora* Nutt., *Picradenia floribunda* (Gray), *Grindelia squarrosa* Pursh, *Gutierrezia sarothrae* (Pursh) and *Bahia chrysanthemoides* Gray. Specimens collected at Raton Aug. 26, gave birth to young at the end of October. Mr. G. B. King at my request, has kindly made measurements of the antennae and legs, and these, with other observations, are given by him below. [*T. D. A. Cockerell.*]

On October 27, 1900, I received a

small box of living specimens of the above mentioned coccid from Prof. Cockerell; which contained three old females giving birth to young; all of the others were adult but younger and contained eggs, embryonic larvae, and some with the embryo removed, while others were nearly matured larvae. The three individuals which I have termed old, all proved to have eleven segmented antennae, with the eleventh segment always longest, two and three next, and five shortest; four, six and seven seem to be nearly equal, as also do eight, nine and ten. The width of the several segments is quite uniform with the first of course as usual broadest. (1) 260. (2) 128. (3) 120. There is very little difference in their width after leaving segment four, the average being about 104. Length of middle leg: Coxa 200–260. Femur with trochanter 680–720. Tibia 580–600. Tarsus 360–380. Claw 108. Width: Coxa 420. Trochanter 306–320. Tibia 160. Tarsus 108. Claw 48. The younger forms have ten and eleven segmented antennae; those with eleven segments, the eleventh were longest, one, two and three next, with five shortest. In the ten segmented forms, ten is longest, then three, two next, then one. The segments of these younger forms seem to be quite variable as do also the middle legs, from the following measurements: The eleven segmented form,— Coxa 200. Femur with trochanter 600. Tibia, 480. Tarsus 300. Claw 100. The ten segmented form,— Femur with trochanter, 560. Tibia 544. Tarsus 300. Claw 104. Newly hatched larvae, red, elliptical in shape, 1 mm. long, ½ mm. broad. Antennae and legs black. Eyes black, large, 56 micromillimeters in diameter. Antennae six segmented, 6 very long, 3 next, 2 and 4 nearly equal, 1 next, and 5 is shortest, although 4 is but very little longer. The formula of their antennae would be 62145. Middle leg. Coxa 60. Femora with trochanter 200. Tibia 192. Tarsus 140. Claw 40. Eggs oval, clear



Genital orifice of *Cryptocerya townsendi* behind the hind legs.

white at first but turn red later on, but when cannot be stated, owing to the fact that all takes place inside of the body of the female. A sketch is given, showing the position and size of the genital orifice, just behind the hind legs, and is a known character of *Crypticerya*. Dr. L. O. Howard seems to have been the first to call attention to this character, together with an exhibition of specimens, before the Entomological society of Washington. The size of the genital orifice in mounted specimens under cover-glass is 1 mm. in diameter.

Measurements of the antennal segments of the three full grown females, the length of which were 5½ mm. 5 broad and 4 high. The measurements in the tables are in micromillimeters.

Segments.	1	2	3	4	5	6	7	8	9	10	11
	136	120	16	56	52	64	64	80	80	80	180
	136	120	16	68	52	68	76	76	80	80	180
	130	120	136	60	52	68	76	80	80	80	160
	120	120	136	64	48	64	76	80	80	80	180
	120	120	136	52	40	72	56	80	80	72	168
	120	120	120	60	48	64	64	68	76	68	168

Measurements of the antennal segments of the younger forms. ♀ 4 mm. long, 3 broad, 2½ high, 10 and 11 segmented.

Segments.	1	2	3	4	5	6	7	8	9	10	11
	120	108	120	60	60	64	72	80	80	80	160
	120	100	104	56	48	60	60	72	88	72	160
	120	112	112	52	48	68	60	56	56	64	160
	80	100	120	48	40	80	52	60	56	136	
	80	84	120	72	40	44	40	40	56	140	

Measurements of the segments of the newly hatched larvae.

Segments.	1	2	3	4	5	6
	52	56	60	44	44	140
	52	60	60	48	44	132
	53	60	60	48	40	132
	53	60	60	48	40	132

[*George B. King.*]

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Heliomata cycladata Grt.

Egg. Laid singly on the edge of a leaf or in a hole or on end on the petiole. Flattened cylindrical, rounded, one diameter distinctly shorter, ends flattened, the basal one the most so, but rounded. Eight ribs projecting at the rim of the micropylar area increasing to a few more by interpolation at about two-thirds the distance toward the other end; raised, coarsely beaded with nearly contiguous clear granules, a little waved and also slightly flexuous in course, joined by thick, curved cross-striae, a little irregular and not always quite parallel, one to each bead. At the base the sculpture becomes confused into rounded pit-like reticulations of which confusion the short interpolated ribs seem a part. Coarse lumpy reticulations also in the small level micropylar area. Dark leaf green, the beading a shade paler, not white. Size .6 × .35 × .25 mm.

Stage I. Head round, higher than wide, scarcely bilobed, erect, free from but lower than joint 2; sordid luteous, grayish on the vertex, ocelli black, mouth brown; width about .2 mm. Body stout and rather thick, normal, smooth, incisures distinct, the segments a little bulging ventrally. Sordid translucent white, pale green from the food; very faint brownish subdorsal mottlings the whole length. Tubercles small, black in white rings. Shields concolorous, uncornified, cervical shield faintly luteous, the rim of joint 2 before whitish. Setae small, obscure.

Stage II. Head rounded, slightly bilobed, erect, slightly lower than joint 2; pale luteous, slightly shining; width .35 mm. Body short and thick, normal, incisures distinct; translucent, pale green from the food, tubercles greenish dusky, rather distinct, pale edged. Faintly indicated dusky longitudinal lines, narrow subdorsal and broad lateral, but very obscure. Thoracic feet blackish; setae short, black, distinct. Abdominal feet and obsolete shields concolorous with body.

Stage III. Head broad, bilobed, rounded, flattened before, erect; pale yellowish, not shining, ocelli black; width .6 mm. Body short and thick, smooth, uniform pale green, translucent, not shining, incisures folded and whitish. Feet concolorous; no shields; no marks. Tubercles minute, blackish; setae short, dusky.

Stage IV. Head round, circular from before, lobes full, slightly bilobed, erect, free; light green, ocelli small, black, antennae moderate, whitish; width 1.15 mm. Body short and thick, the central segments only a little longer than the end ones and shaped about as in Noctuid larvae, the ends being slightly contracted. Feet normal, the thoracic ones moderate, the abdominal on joints 10 and 13, the latter with large triangular plate; anal plate rounded; cervical shield divided into two well separated ellipses. Tubercles distinct, rather large, not elevated, concolorous; setae short, black. Entirely light green without marks, the plates and tubercles slightly shining, the skin dull. No anal prongs. Tubercles normal, ia to iib equally spaced on joints 3 and 4 and separate. Spiracles narrowly dark rimmed.

Stage V. Head round, circular, flat before and a trace flattened on the apex; clypeus two thirds to vertex, the paraclypeal pieces very narrow and obscure; finely shagreened; width 1.9 mm. Body robust, the segments not elongated, the end ones proportionately a little contracted, obscurely 6-annulate. Feet normal, short, the anal pair triangular and slightly produced at the upper angle; anal plate elongated, rounded. Tubercles very small, not elevated, distinct; setae short, pointed; both black. The coloration varies from green to more or less heavily spotted. In the former the head is luteous green, subtranslucent, ocelli dark. Body green like the leaf, the folded incisures yellowish, faint dotted whitish subdorsal and lateral lines; subventral fold yellowish; spiracles brown rimmed; dorsal vessel darker green. In the spotted form the head is green mottled broadly with brown spots over the vertex. Body green with many fine brown specks forming triangular brown spots subdorsally on joints 5 to 8, pointed before and in general segregated into geminate parallel lines. The lines are subdorsal, lateral and subventral, enclosing paler spaces, but very obscurely. Also a faint dorsal line. The dottings are somewhat mottled, heaviest centrally on the segments, contracted, and therefore darker, on joints 10 to 13, the anal plates spotted. Venter rather broadly green, paler lined. Feet brownish dotted.

The larvae spun very slight webs of brownish silk in the ground at the surface and turned to thick stout pupae. Abdomen small tapering. Dark brown, the cases a little greenish. Body coarsely punctured, cases shagreened as if irregularly eroded; abdominal segments ridged in front. Cremaster a long spine, widened at base and with two recurved hooks at tip.

Food plant probably locust (*Robinia pseudacacia*); at least the larvae fed readily on this plant and the moths were taken flying among the trees. Eggs June 10th, mature larvae July 10th. Single brooded, the fall and winter being passed as pupa. Larvae from Washington, D. C.

THE KATYDID'S CALL IN RELATION TO TEMPERATURE.

The following observations on the frequency with which the call of the Katydid (*Cyrtophyllus perspicillatus*) is repeated and their relation to the temperature at the time were made in Milton, Mass., by Mr. Roland Hayward, between August 26th and October 7, and are here printed from his memoranda. The first column gives the date, the second the temperature in degrees of the Fahrenheit scale, the third the number of calls "katydid" or "she did" per minute. In all cases they were counted for at least one minute.

Aug. 26	82°	89
27	78°	76
28	67°	45
29	69°	46
30	72°	60
31	70°	47
Sept. 1	66°	39
2	73°	58
3	74°	62
4	73°	60
8	68°	37
9	68°	43
10	63°	20
11	73°	60
12 (windy)	68°	38
13	60°	19
14	68°	35
21	67°	39
22	63°	26
24	65°	35
25	58°	21
26	58°	20
27	64°	32
29	60°	18
30	63°	24
Oct. 1	58°	15
4	64°	32
5 (7 P. M.)	72°	58
(8.30 P. M.)	70°	47
(10.15 P. M.)	68°	39
7	63°	30

PROCEEDINGS OF THE CLUB.

11 January, 1901. The 217th regular and 24th annual meeting (since incorporation) was held at 156 Brattle St., Mr. A. P. Morse in the chair.

The annual reports of the officers were read. The following officers were elected for 1901: secretary, Roland Hayward; treasurer, Roland Hayward; librarian, Samuel H. Scudder; members at large of executive committee, A. P. Morse, S. H. Scudder.

The annual address of the retiring president, J. W. Folsom, was read, entitled: The distribution of holarctic Collembola,—published in full in PSYCHE.

A NEW VOLUME OF PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

PSYCHE.

THE HABITS AND NOTES OF THE NEW ENGLAND SPECIES OF OECANTHUS.

BY WALTER FAXON, CAMBRIDGE, MASS.

(In a Letter to S. H. Scudder.)

Two years ago I became a good deal interested in our Oecanthi. I found four species in the region about Cambridge, all of them distinct in their markings, and all save one readily distinguished by their habits and notes.

1. *Occ. niveus*; whitish-green, with a roundish black spot on basal segment of antennae, and another on the second segment. The song is the well-known rhythmical cricket-note of autumn evenings.

2. *Occ. angustipennis*; greenish-white, more niveous than *niveus*! Like the last, chiefly nocturnal, singing on trees and shrubs. Basal joints of the antennae with crescentic black marks. Song entirely different from that of *niveus*, consisting of a trill of several seconds' duration, succeeded by a short pause; this song suggests the spring note of the toad, heard afar off.

3. *Occ. nigricornis*; strong yellowish cast on the wings; legs and antennae with a good deal of fuscous; basal segments of antennae marked thus [showing a figure with a heavy digamma on the basal joint and two longitudinal lines on the second joint], though the pattern is often obscured by the fuscous suffusion of the whole antennae. Note a long continuous *r-r-r-r-r*, which sounds in a small way like a *Cicada*. Diurnal, singing particularly on low herbs, Solidago etc., on edges of swamps and also in dry fields.

4. *Occ. 4-punctatus*; similar to *Occ. nigricornis*, but antennal joints marked thus [the second joint as in the last; the basal with a reversed figure 7, the short arm followed by a dot]. Rarest of the four species about here; diurnal, found on herbs in dry fields. Song similar to that of No. 3, but clearer in tone and no doubt sufficiently distinct on close acquaintance. I have found only two or three of this species, in Cambridge and Lexington.

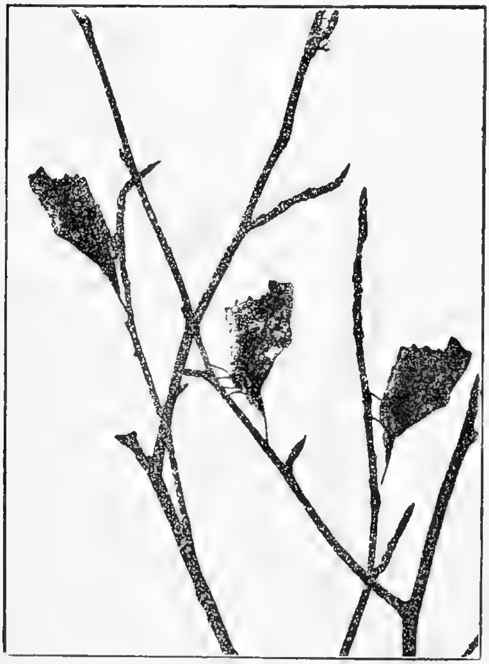
I have found all four of these species within a few rods of the Museum.

ON THE PROTECTIVE COLORATION AND ATTITUDE OF LIBYTHEA CELTIS ESP.

BY NICHOLAS KUSNEZOW.

[From Horae Entomologicae, xxxv, 1900.]

The article describes the protective coloration of the imago of *Libythea celtis* Esp. and its original attitude in repose. The observations were made by the author on the southern coast of the



Crimea; they do not require detailed explanations, which appear in the Russian text; the appearance is clear from the subjoined figure, which is explicit enough. The butterfly in repose exactly resembles a dead leaf, just as many tropical Rhopalocera with the famous Kallima at the head. The circumstance that *Libythea celtis* makes use of its palpi and antennae for the simulation of a stalk of a leaf is very singular, as no tropical "leaf-shaped" butterfly does it. In this respect the example of *L. celtis* is unique. In the majority of cases the role of this stalk is borne out by various appendices of the hind wings.

The coloration completely conforms to the habits of the insect. The well known species with tail-shaped appendices of the hind wings have a habit of raising the fore part of the body, applying these appendices to a stick and concealing their antennae between the fore wings; the *L. celtis*, on the contrary, inclines forwards, stretches its palpi and antennae, touching with them the leafless twig, and raises the anal angles of the hind wings.

The form of the folded wings and the presence on the underside of the hind wings of a dark median vein — observed only in the *L. celtis* — make the resemblance to a leaf still more complete.

We have thus in this species a unique example of an European butterfly, which mimics the dead leaf as perfectly, and possibly even not worse, than several celebrated tropical species.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.—IV.

HYMENOPTERA.

(Part)

BY WILLIAM H. ASHMEAD.

Family *Crabronidae.*

(1) *Stenocrabro cinctitarsis*, new species.

♂.—Length 6.5 mm. Black, shining; the tibial spurs, the extreme apex of the first joint of the anterior tarsi and joints 2 and 3 entirely, and joints 1 to 3 of middle tarsi, yellowish-white. The clypeus at apex medially is subproduced and clothed with a dense silvery pubescence; the mandibles and the mesopectus with sparse silvery hairs. The head is quadrate, smooth above, but anteriorly it is sparsely, minutely punctate and with a median grooved line; the eyes are large and converge anteriorly; the ocelli are arranged in a triangle, the space between the margin of the eye and the lateral ocelli being greater than the space between them. Mandibles black, bidentate. The pronotum is not short and has a deep transverse impression above, the hind margin having a delicate median notch which conforms to a delicate median grooved line on the anterior half of the mesonotum; both of these sclerites are smooth and shining, although with a high power lens one can detect sparse, microscopic punctures scattered over the surface. The metathorax above is smooth, polished, with a broad median groove and an oblong area on each side of the groove; the posterior face of the metathorax is transversely regulose, the pleura striate. The wings are hyaline, with a faint fuscous tinge, the stigma and veins being brown, the stigma and costal vein dark brown; the recurrent nervure unites with the cubital cell just beyond its middle. The abdomen is a little longer than the head and thorax united, subclavate, smooth and shining, but with a high power lens, exhibits, particularly on the second and third dorsal segments and the base of the third, very fine, delicate, transverse aciculations.

Type.—Cat. No. 5349, U. S. N. M.

Habitat.—Top of range between the Sapello and Pecos Rivers at an altitude of about 11000 feet. One ♂ specimen.

Family *Pompilidae.*

(2) *Ceropales fraterna* Smith.

Prof. Cockerell has taken one ♀ specimen. It is a species widely spread over Canada and the United States.

Family *Eumenidae.*

(3) *Ancistrocerus sexcingulatus*, new species.

♂.—Length 8 mm. Black with the head and thorax rather coarsely punctate; a broad apical band on dorsal abdominal segments 1 to 6, a band at apex of ventral segments 2 and 3 and a spot at hind angles of 4 and 5, the mandibles except at apex, the clypeus entirely, a short orbital line opposite the antennae, a spot between the antennae, a dot on temples back of the eyes, the scape beneath and two or three of the following antennal joints *beneath*, a transverse band on the anterior margin of the pronotum, two spots on the tegulae, two dots on the scutellum and the legs from the apices of the femora, lemon-yellow; flagellum beneath and including the hook and the penultimate joint fulvous.

Type.—Cat. No. 5350, U. S. N. M.

Habitat.— New Mexico.

Described from 1 ♂ specimen. The species comes evidently nearest to *A. bustamenti* Saussure, described from Mexico and known only in the female sex.

Family *Formicidae.*

(4) *Formica neorufibarbis* Emery.

Two ♀ specimens. (Determined by Mr. Theo. Pergande.)

Family *Tenthredinidae.*

(5) *Tenthredo erythromera* Provancher.

One ♀ specimen. Occurs in British Columbia and Alaska.

(6) *Labidia originalis* Norton.

One ♀ specimen. Recorded from Colorado, British Columbia, Vancouver Island.

LEPIDOPTERA RHOPALOCERA.

BY T. D. A. COCKERELL.

Pyrameis cardui L.

Vanessa milbertii subsp. *subpallida* Ckll.

Argynnis eurynome Edw. Very abundant.

Argynnis electa Edw., det. Skinner. Only one taken; it is common in the same region at lower altitudes, where *eurynome* is not found.

Brenthis helena Edw, det. Skinner. Abundant. Dr. Skinner would not separate *Brenthis* from *Argynnis*, but they seem to me sufficiently distinct.

Erebia epipsodea Butler.

Coenonympha ochracea Edw. Common; forms with only one pupilled ocellus on under side of secondaries.

Chrysophanus helloides Bdv. Common.

Lycæna rustica Edw. Common; one is smaller than usual, with the ground-color of under side of secondaries quite dark, thus approaching *L. aquilo*.

Colias eurytheme Bdv.

Colias scudderi Reak. var. *flavotincta* n. var; ♀ delicate pale yellow, ♂ normal. The ♀ is figured (fig. 5) on Edwards' plate in Butt. N. A. Several seen; my wife took a pair.

Parnassius smintheus Dbl. & Hew. One ♂ taken by my wife; expanse 63 mm. This is certainly *smintheus*, considering the locality, but it is unusually dark, and marked almost exactly as *P. clodius* var. *baldur*, figured (pl. 39, fig. 7) in Holland's Butterfly Book.

Pamphila comma nevada Scudd. det. Skinner. Common, both sexes taken.

Pyrgus centaureae Ramb., det. Skinner. ♂.

THE SPECIES OF DIAPHEROMERA (PHASMIDAE) FOUND IN THE UNITED STATES AND CANADA.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The common "walking stick" of the oak bushes of the northern United States, *D. femorata* (Say), was the only species known to Gray, when in 1835 he founded this genus. It was not until 1864 that a second, intimately allied, species was added by Walsh, and since 1875, when a third much larger species was described by Stål, no further additions have been made. From rather meagre material in my collection I can now add two other species, one from North Carolina, the other from New Mexico. No species appears to occur west of the continental divide. I subjoin a table for the easy separation of the species, based principally on the male sex.

Table of the United States species of Diapheromera.

a^1. Male cerci more or less, generally conspicuously, arcuate.

- b^1. Larger and stouter form; under side of middle and hind femora distinctly spined throughout; male cerci much broader apically than at base, more or less spatulate. . . . . *denticrus.*
- b^2. Smaller and slenderer forms; middle and hind femora without conspicuous spines beneath, excepting the subapical spine; male cerci subequal throughout.
  - c^1. Ninth abdominal segment of male apically inflated, and here nearly half as broad again as at base, the seventh and eighth segments of subequal length . . . . *carolina.*
  - c^2. Ninth abdominal segment of male subequal, scarcely larger at apex than at base, the seventh segment much longer than the eighth.
    - d^1. Male cerci with a blunt tooth at inner inferior base; female cerci relatively stout, about half as long as last dorsal segment *femorata.*
    - d^2. Male cerci with a sharp thorn at inner inferior base; female cerci relatively slender, almost or quite as long as last dorsal segment . . . . *veliei.*

a^2. Male cerci rigidly straight . . . . *mesillana.*

Diapheromera denticrus.

Diapheromera denticrus Stål, Rec. Orth., iii, 76 (1875).

Originally described from Opelousas, La. My specimens all come from Texas (Belfrage), New Braunfels, Tex. (Lincecum), and the Gulf coast of

Texas (Aaron), excepting a small female from Las Cruces, N. Mex. (Cockerell). It is perhaps this species to which Gosse alludes (Lett. Alab., 275) as the larger of two species found in Alabama. It varies somewhat in size, two males before me being respectively 90 and 125 mm. in length. The species is figured of half natural length in Harper's Magazine, vol. lxxxviii, p. 457.

Diapheromera carolina sp. nov.

♂. Stouter than *D. femorata*, testaceo-castaneous, glistening, the thorax with a rather broad median bronze-fuscous stripe, not reaching the median segment, and interrupted at the posterior end of the mesonotum, the fore legs greenish, the antennae testaceous; thorax with excessively fine transverse striation. Mesothorax and metathorax (including median segment) of similar length. Seventh and eighth abdominal segments of subequal length, each faintly enlarging from base, the ninth a little shorter, apically inflated and subglobose, nearly half as broad again at apex as at base, the cerci much as in *D. femorata*, but stouter, more compressed and without basal tooth.

Length of body, 67 mm.; head, 3 mm.; mesothorax, 13.5 mm.; fore femora, 20.5 mm.; middle femora, 14.5 mm.; hind femora, 19.5 mm.

1 ♂. North Carolina (Morrison).

In most features this species stands nearly intermediate between *D. denticrus* and *D. femorata*.

Diapheromera femorata.

Spectrum femoratum Say, Exp. Long, ii, 297 (1824); Amer. ent., iii, pl. 37 (1828).

Diapheromera femorata Harr., Treat. ins. inj. veg., 119 (1840, 1841).

Phasma (Bacteria) femorata de Haan, Bijdr. kenn. Orth., 101, 134 (1842).

Bacunculus femoratus Uhl., Harr., Treat. ins. inj. veg., 3 ed., 146 (1862).

Diapheromera sayi Gray, Syn. Phasm., 18 (1835).

Bacteria sayi Charp., Orth. descr., pl. 6 (1841–1845).

Bacteria (Bacunculus) sayi Burm., Handb. ent., ii, 566 (1838).

Bacunculus sayi Thom., Trans. Ill. st. agric. soc., v, 441 (1865).

Bacteria linearis Gosse, Lett. Alab., 275 (1859).

Originally described from the "United States," Niagara and the Missouri River being specified. I have seen specimens from Prout's Neck, Me., Vermont, vic. Boston, Massachusetts, Prescott, Ont. (Billings), New York, Niagara Falls, Maryland (Uhler), Virginia, Illinois, Manitoba, Jefferson, Dallas Co. and Denison, Iowa (Allen), St. Louis, Mo., Dallas, Tex. (Boll) and Ringgold Barracks, Tex. (Schott). It has also been reported, but perhaps sometimes by mistake for the next species, from Montreal (Caulfield), New Hampshire (Scudder), New Jersey (Say, Smith), Pennsylvania (de Haan), Wisconsin (Walsh and Riley), Minnesota (Lugger), Kansas and Nebraska (Bruner), Kentucky (Garman), Indiana (Blatchley), South Carolina (de Haan), Tennessee (de Haan, Saussure), Alabama (Gosse), New Mexico and Mexico (Haldeman).

The species has been frequently figured.

Diapheromera veliei.

Diapheromera velii Walsh, Proc. ent. soc. Philad., iii, 409–410 (1864).

Originally described from Nebraska, and since then reported only from that state and Illinois. I have seen specimens from Maryland (Uhler), Virginia Wirt Robinson), Georgia (Morrison), Ohio, Southern Illinois (Thomas), Manitoba, Dallas Co. and Jefferson, Iowa (Allen), Lincoln, Valentine and Sand Hills, Nebr. (Bruner), Platte River, Nebr. (Hayden), Barber Co., Kans. (Bruner), Dallas, Tex. (Boll), Ringgold Barracks, Tex. (Schott), Pecos River (Capt. Pope), Albuquerque, N. Mex. (Bruner), Sancelito, Mex. (Palmer), San Pedro and Montelovez, Coahuila, Mex. (Palmer), and Venis Mecas and Sierra San Miguelito, San Luis Potosi, Mex. (Palmer).

Diapheromera mesillana sp. nov.

♂. Slenderer than *D. femorata*, uniform greenish flavous, the antennae infuscated beyond the basal third, the thorax smooth, with an obscure median carina; subapical inferior spine of middle and hind femora rather slight. Mesothorax and metathorax (including median segment) of equal length. Seventh and ninth abdominal segments subequal in length and distinctly longer than the eighth, all equal in width and nowhere enlarged, the ninth rather feebly and angularly emarginate, exposing a small, transverse, apically arcuate, supraanal plate; cerci about as long as the ninth abdominal segment, rigidly straight, directed backward and not at all downward, slender, tapering, blunt tipped, externally convex, and internally concave.

Length of body, 55 mm.; head, 3 mm.; antennae, circa 37 mm.; mesothorax, 12.5 mm.; fore femora, 14.5 mm.; middle femora, 11 mm.; hind femora, 13.5 mm.

2 ♂. Between Mesilla and Las Cruces, N. Mex., June 30 (A. P. Morse).

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Eudule mendica Walk. This larva has proved unusually difficult and for no real reason. As early as 1871 Mr. W. Saunders published on the first stage, but was unable to go further as he could find nothing that the larvae would eat. I have tried the same experiment with equal ill success, till the fortunate discovery of the food plant by Mr. Lucock (Can. ent., xxx, 248, 1898) rendered the whole matter simple. The food plant was also independently discovered by Mr. W. D. Kearfott, who has kindly presented to me an inflated larva and pupa shells.

The first stage has been described by Saunders, the last by Lucock, both briefly and the pupa has been remarked on by Hulst and Smith.

Egg. Suspended on a slender silken fibre which runs from one object to another so that the egg swings free in the air. In nature the eggs were found laid on sheep's wool stuck on the base of a tree in a pasture, on horse hair in a similar location and on spider webs under the edges of rocks. Elliptical, flattened slightly on two sides but not so much as usual. Reticulations represented by rather smooth shallow dents, just indicated. The whole surface besides very finely but distinctly shagreened, the little flattened elevations all quite regular, rounded; slightly shining, pale yellowish, changing to pinkish yellow; size .8 × .6 × .5 mm. Eggs from Keene Valley, New York, June 25th; Jefferson Highlands, New Hampshire, June 30th; Washington, D. C., May 31st.

Stage I. Very long, slender and looping with great rapidity till the food plant is found; when disturbed suddenly curl up in an irregular S-shape and keep still. Of normal Geometrid structure, abdominal feet on joints 10 and 13; segments annulate, not very regularly. Tubercles moderate, distinct, dark, a little elevated, normal, i and ii in line, iii above and before the spiracle, iv behind and below it, v sub-ventral; no subprimaries. Setae short, stiff with small glandular tips. Head blackish; body sordid yellowish white, rather translucent. After eating, sordid grayish green, feet pale; no marks. At the end of the stage a broad irregularly powdery subdorsal band appears.

Stage II. Head strongly bilobed, round, flattened before, free from joint 2; black, lighter on the apices of the lobes before; width .6 mm. Body moderately slender, uniform, finely, but not distinctly, numerously annulate. Anal flap truncate, notched, anal feet with small plates; shields uncornified, concolorous. Tubercles small, black, iv on the elongated segments (5 to 10), on a large, rounded, elevated, black base; all distinct. Setae short, black, club-shaped at tip. Whitish, faintly green from the food a broad, diffuse, pulverulent purple-brown subdorsal band on joints 2 to 13, the feet also marked slightly with this color and tubercle iv surrounded by it. Spiracles black; feet normal.

Stage III. Head rounded, slightly squared at apex, not bilobed, erect, free from joint 2; black, whitish marked over the clypeus and in an erect line to the top of each lobe, joined by a transverse bar above the clypeus; width .8 mm. Body whitish, speckled by the distinct, though not large, slightly elevated black tubercles, shading to pale slate gray dorsally and ventrally. Segments numerously but not very strongly annulate. Dorsum irregularly speckled with brown, on thorax and less plainly on joints 10 to 13 forming a diffuse subdorsal band; a more evident spot behind the spiracle. Shields concolorous, not cornified. Body somewhat slender and elongated, cylindrical, smooth; all feet whitish.

Stage IV. Head cordate, erect, flattened before, the lobes slightly projecting in front, with an elevated tubercle i; whitish, gray mottled, a blackish shade about the sides and over the lower part of clypeus, reappearing in a patch on the inner side of the vertex of each lobe; width 1.2 mm. Body long and slender, cylindrical, uniform; joint 13 truncate, slightly concave posteriorly; anal feet narrowly triangular; no prongs. Central segments with a broad smooth space anteriorly, then about 15-annulate, not very distinctly, 12 of the annulets situated between tubercles i and ii, the end segments normally contracted. Flesh colored, shaded with greenish and sparsely brown dotted; on the thorax the dots still slightly indicate a subdorsal line, but posteriorly it is entirely broken up, forming a group of dorsal dottings on joint 9 and about tubercle iv on 8 and 9. Tubercles slightly prominent in blackish patches. Setae short, dark, directed obliquely posteriorly. No shields.

Cocoon. The larva is slung in a delicate, open, reticular web. I see no trace of the "girth" described by Riley and Smith and suppose the net was partly broken in their specimen giving rise to the appearance of a single strand.

Pupa. This hangs in the net with the

cast larval skin projecting behind. The shape is peculiar. Nearly straight along the ventral line, the head projecting a little ventrally and a slight indentation at base of wing cases. Dorsum angled at the mesonotum and first abdominal segment, then tapering to the anal segment; wing cases raised a little at their margins. No cremaster, the anal end smooth and rounded, glued firmly in the end of the cast skin, from which it is with difficulty dissociated. Integument soft and delicate; pupa motionless. Thickly overlaid purplish dots and mottlings on a whitish ground, interspersed with a few orange colored specks especially along the dorsal line posteriorly and about the spiracles; wing cases purplish shaded, somewhat wrinkly.

Food plant wild violet, on the leaves of which the larvae feed. Double brooded, the second generation said to hibernate as partly grown larvae. Doubtless this generation has more than four stages; the first generation is the one here described.

Occurrence of Melanoplus extremus in Northern Labrador. — In 1864 during a summer spent on the Labrador Coast, I found a Pezotettix-like species of Melanoplus, with short wings, at Square Island, but the species was not determined.

Last summer Prof. E. B. Delabarre during his expedition to northern Labrador observed and collected some locusts, and kindly presented me with three specimens. One is from Nachvak, collected at a point two miles inland from the harbor, and two others at Cape Mugford directly on the coast, at a point 300–400 feet above the level of the sea. The locusts were common locally, in spots. Dr. Scudder has kindly identified them as *Melanoplus extremus junius*. This is its first occurrence in the Labrador peninsula, the species occurring throughout British America and on the summit of Mt. Washington, N. H.

A. S. Packard.

Occurrence of Anopheles quadrimaculatus in Maine. — It may be well to note the northernmost point where an undoubted Anopheles has been found, and identified by an expert. In a list of Diptera named for me by Baron von Osten Sacken, the highest living authority on Diptera, and especially those of this country, is the name of this mosquito. The insect was collected and named for me about the years 1861–3. It was not uncommon at Brunswick, Maine. I am therefore familiar with this species, having taken it several times since that date. So far as I am aware no malaria has as yet been known to exist in Maine, and there at least Anopheles exists with a conscience clear *in re malariae*.

A. S. Packard.

Correction — On p. 177, in the third column of the first table, the figures in the second and third lines should be 136 and not 16.

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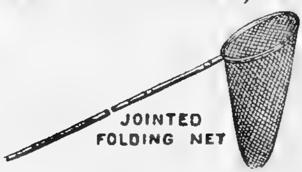

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The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

J. Henry Blake, del.

OENEIS SEMIDEA.

PSYCHE.

A COURAGEOUS BUTTERFLY, OENEIS SEMIDEA.*

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

High up on the wind-swept peaks of the White Mountains of New Hampshire, far above the upper limit of the trees, with no other protection than the lee of the rocks, the crevices between the angular blocks of gray stone which conspicuously mark those barren altitudes, or the clumps of sedge which cover their more level reaches, lives a frail brown butterfly, which is found in no other spot in the world save the very tops of the still higher peaks of the Rocky Mountains in distant Colorado, twelve or fourteen thousand feet above the sea. It has relatives, some so close as sometimes to be mistaken for it, in the far northern latitudes of Labrador, where the conditions of life are similar; but nowhere in New England or the surrounding country can it or anything like it be found, save within two or three miles of Mt. Washington, at an elevation of from five to six thousand feet above the sea.

Semidea, half a goddess, is the name bestowed upon it by our pioneer naturalist, Say, in token of its life among the clouds. Half-way to the heavens is its abode, and here, amid the winds and storms which rage about the mountains, the little colony flourishes as if it did not know that butterflies are preeminently creatures of the sun and warmth, and had never heard of the tropics which seem so peculiarly their home.

Yet it is but a feeble creature, even for a butterfly; for though its body and legs are covered with a furry clothing, as if to protect it from the cold, its thin, gauze-like wings are even more flimsy, delicate and limp than usual among its tribe, and seem ill-fitted indeed to withstand the furious blasts and sudden gusts that prevail on those breezy uplands.

And, truth to tell, it is but a feeble flutterer; often when one has been startled into flight by my near approach on a tempestuous day, I have seen the wind catch it and sweep it nearly out of sight in a couple of seconds; and once I was able to follow one thus borne along against a background of white cloud, until it was swept far beyond the mountain-side, whence probably it was unable to return, and perished far from home.

* Reprinted, with slight additions, from the Youth's Companion of 1895, to accompany the new illustration opposite.

Yet this very weakness is probably one cause of the ability of this species to maintain its hold in its peculiar dwelling-place; for the study of the insects of wind-swept regions, like oceanic islands and high mountain summits, shows us that to maintain their life the inhabitants must be either specially strong-winged to withstand the gales, or very weak-winged, or, indeed, often wingless, so as not to attempt to contend against the wind, or even to be quite unable to fly.

So our weak-winged Semidea rarely takes flight at all in windy weather, or, if caught by a gust, makes no attempt to cope with it, satisfied if it be allowed speedily to drop into some sheltered spot where it may secure a foothold. It then proceeds forthwith to creep into some cranny; or, if still prevented by the wind, falls over upon its side, feet to the windward, but clinging to the rock or soil, closes its wings, and tucks them together so as to offer the least surface to the dangerous breeze. Our illustration (plate 1) represents one thus clinging to a stone, a bit of lichen-covered rock brought for the artist's use from Mt. Washington; it shows, also, as well as can be shown without color, how the exposed mottled portions of the butterfly's wings harmonize with the freckled surface of the rock,—a case of "protective resemblance."

So it maintains its hold. And certainly not with difficulty, for it is one of our commonest butterflies; and though hundreds, perhaps thousands, are annually captured by enthusiastic collectors, mostly within an area of a single square mile, it continues as abundant as ever, and seems better able than the wide-ranging bison to avoid extinction. During the entire month of July the butterflies swarm over the rocks and sedgy plateaus of the upper summits, directly through which thousands of travellers yearly make their pilgrimage by the cog-railway or the carriage road.

During the latter part of this month hundreds of thousands, perhaps millions, of eggs are laid by the butterflies, from which, in about a fortnight, hatch big-headed, striped mites of caterpillars; these nibble at the sedges a short time, and then, their parents long dead, go into winter quarters, hiding in the neatest crevices they can find.

Probably the whole of the next summer and part of still another is spent in this stage, in which the caterpillar feeds both by night and by day upon the sedges, that so abound upon the mountain-side as often to give the appearance of a pasture ground.

Some, doubtless, mature sooner than others, or we should see the butterfly only in alternate years, whereas it is equally common every year. When not feeding, the caterpillar is hiding between the rocks in just such places as it chooses to pass the winter in, and where also it changes to a chrysalis, lying flat upon its back without further protection than the rocks afford; unless, indeed, it cuddles up against some moss, and shapes that side into the form and protection of a cell.

The chrysalis state is assumed in June, and lasts two weeks or more, and then again, after two years more or less of preparation, the butterfly is once more upon the wing — a stranded relic of the great Ice Age, like the alpine sandwort, *Arenaria groenlandica*, whose honeyed sweets it now robs.

VARIATION IN TRIDACTYLUS.

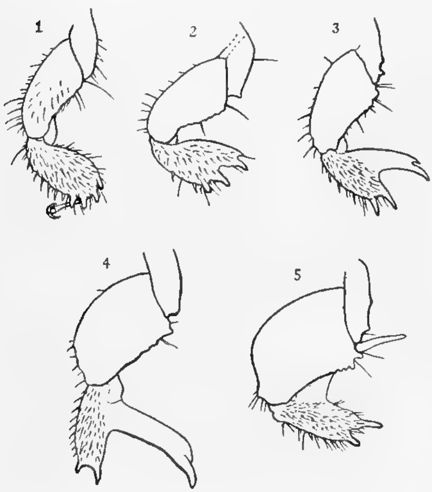
BY A. P. MORSE, WELLESLEY, MASS.

Tridactylus is a genus of small, fossorial crickets, allied in structure and habits to *Gryllotalpa*, the mole-cricket, and differing most noticeably from that genus, among several things, in being smaller in size and possessing remarkable saltatory powers.

Representatives of the genus occur over the greater part, at least, of the United States, and range in size from six to twelve millimeters in length when adult. They frequent the margins of streams and ponds, burrowing in the sandy loam of the banks and shores, and may be secured, when a station is discovered, by sweeping rapidly just above the ground with a net of cheese-cloth or other close-meshed material. Owing to their alertness, activity, and leaping mode of progression close observations of their habits are exceedingly difficult to make out-of-doors and but little is known regarding them. Whether confinement would secure satisfactory results remains to be learned, but it is hoped that some one having an opportunity to do so will make the attempt and if possible discover the special function of the remarkably modified anterior tibiae of the male in certain species and the significance of the variation noted below.

While collecting on Nantucket Island late in the afternoon of July 12, 1900, I found a locality for Tridactylus on the shore of a small pond and captured several examples of both sexes. On the following day additional specimens were secured in the same place and about an adjoining pond. On my return home, examination after mounting disclosed an interesting state of affairs.

The 52 specimens taken on the two successive days in this one locality consist of one immature, 18 females, and 33 males. These exhibit no essential difference in color, size or markings leading one to infer the presence of two species, nor do the female examples differ in structural details. A close examination of the males, however, reveals a singular variation in the structure of the anterior tibiae. In about one third of the males the form is the same as that of the female (Fig. 1), — more or less irregularly ovate in outline, terminating distally in four prominent, equidistant teeth, with the convex posterior face thickly set with hairs and a row of stouter hairs or spinules on the outer margin, the tarsus being inserted between the first and second teeth and lying on the anterior face. In three of the others, while the structure remains similar, the outline of the tibia has become subtriangular through the production of the inner side of the distal



Tridactylus terminalis Scudd. Left anterior leg viewed from behind. Fig. 1. Female. Fig. 2. Male. Fig. 3. Male Fig. 4. Male. Fig. 5. Male; tibia closed upon the femur.

end (Fig. 2); in addition to this, there is a slight but distinct deepening of the fissure between the second and third teeth. This lengthening of what may be called the inner limb of the tibia and deepening of the emargination between the inner and outer limbs is exhibited by all the remaining specimens in progressive degree until we have a remarkably bifurcate organ (Figs. 4, 5) whose relation to the normal form would be made out with difficulty but for the series of connecting gradations.

In addition to this bifurcation and the elongation of the inner limb, the latter loses its hairy covering, the innermost tooth nearly disappears, the second is greatly prolonged into a backwardly directed claw-like organ, the third and fourth teeth (on the outer limb) become enlarged and produced, the angle between the two limbs becomes greater and greater, and the femur acquires tooth-like protuberances on its proximal, inner, ventral angle and becomes greatly enlarged (Figs. 1–5). The gradation is so perfect (even in this relatively small series of examples) that it is impossible to draw any sharp line of demarcation between the specimens; sometimes, even, the right and left tibiae of the same insect are appreciably different in form. Of the 33 males, in ten the tibia is of normal (♀) form; in three others it is slightly but perceptibly modified, in one it is intermediate between Fig. 1 and Fig. 2, in two it is of the form of Fig. 2, in two intermediate between Fig. 2 and Fig. 3, in four like Fig. 3, in one midway between Fig. 3 and Fig. 4, in four but little less modified than in Fig. 4, and in six it has the form of Fig. 4 (open) and Fig. 5 (closed), the greatly elongated second tooth varying much in curvature (foreshortened in Fig. 4).

Each of the extremes of the series is thus represented by about one third of the specimens, and the intergrades by the remaining third, but these intergrades are so numerous and the gradation is so perfect that it is quite impossible to separate the specimens into two series. Nor is there reason on other grounds for so doing. The specimens evidently all belong to one species exhibiting a high degree of secondary sexual variation in the male, a variation whose function and value have yet to be determined, but the key to which may perhaps be secured by careful observation of the habits of the species.

This character—the form of the anterior tibiae of the male—has been used for many years in systematic treatises for distinguishing the species of this genus but it is now evident that its worth has been greatly over-rated and it must be regarded with suspicion and in some cases as worthless for that purpose. In certain forms, of which I have examined considerable series, this great variability apparently does not occur, the tibiae of the male and female being alike. The extremely bifurcate condition was recorded and figured by Mr. Scudder in characterizing *T. apicalis* Say and *T. terminalis* Scudd. (Boston Journ. Nat. Hist., vii, p. 424,—1862). The form I have treated above is the latter of these—*terminalis*; and from material in Mr. Scudder's collection I am able to state that at least the normal (♀) form of tibia is found in males of *apicalis* also. Possibly *terminalis* may prove to be but a race of *apicalis* but until the genus is revised it is best to regard them as different, *apicalis* appearing slightly larger, paler in color, and usually having relatively longer wings. Both of these forms are widely spread over at least the eastern half of the United States, and are apparently not uncommon locally. It is hoped that anyone having an opportunity to do so will make observations on the habits of these interesting little crickets and attempt to discover the use of this peculiar modification of the tibiae and its value to the insect.

PULVINARIA INNUMERABILIS RATHV.

BY GEO. B. KING, LAWRENCE, MASS.

Although *Pulvinaria innumerabilis* Rathv. has been the subject of many published articles, together with illustrations of the species in its various stages of developments; it has become quite evident to the writer, that a more clear and comprehensive description should be given together with some descriptive notes of its variation and distribution; moreover it is hoped that the following description will enable any entomologist who may have the slightest knowledge of Coccidae, to recognize the species at once from any of its nearest allies. With this hope in view, the following description and notes have been carefully made and a large amount of material has been examined from various localities and food plants, so as to give their specific variation. Of course it is a well established fact, that the genus Pulvinaria is known by its producing a cottony ovisac, in which are deposited the eggs of the female scale. The color of the scales are variable, but in this species the typical color is red-brown, not at all shiny, elongate oval in shape, usually broader anteriorly, and always narrower posteriorly, 7 mm. long, 5½ broad. Boiled in caustic potash the following structural characters are observed.

Antennae 8-jointed, joint 3 always longest, 4 next, then 2 and 8 although sometimes 8 will be longer than 2. 5 is next and always longer than 6 or 7 which is the shortest and often equal. Front legs, with the coxa 120 long; femur and trochanter, 176; tibia, 164; tarsus 80; width coxa 20; trochanter 60; tibia 32; tarsus 20. Spines of lateral cleft in threes, one very long and stout, curved at the end 92 to 108 in length; two short and stout 32 to 40 long. The margin of the body is provided with a row of stout blunt spines 36 to 40 long, and a row of short, thin and sharp spine-like hairs 16 long; these are easily lost in dissecting. Between the antennae and above the anal plates, are several long thin hairs 48–92 and 120 in length; interspersed with these are some short spine-like hairs like those of the outer margin. Anal ring normal with six long stout bristles. The arrangement of hairs on the several joints of the antennae are as follows: the first joint has three short spine-like hairs; the second, from one to two are long; the third from one to two; the fifth two to three; the sixth one; the seventh one to two; and the eighth seven to nine. The measurements of the several parts above, and those given in the tables are in micromillimeters.

A quantitative study of these variations is here given. It should be stated in this connection however, that intermediate individuals are found with the typical forms, which are sometimes quite small, and the reason for their size is no doubt due to being deprived of sufficient food, owing to the fact that they are found on the small twigs, where the supply of food is not so great as it is among the larger limbs of the tree, and it is here where the larger forms are found. These smaller forms do not differ materially in color, shape or structurally; all are practically the same. Specimens from Georgia are quite dark, variable in shape, some nearly hemispherical and in texture the scales are quite thick. Those from New Mexico are about the same in color and texture, but somewhat smaller. The scales on maple at Washington, D. C., are practically the same as those found on maple in Massachusetts. Those from Wisconsin (Div. Entom.) are quite different, being smaller and nearly black in color. Those from North Carolina are different still, practically hemispherical in shape, of a light brown color and quite small. Several lots of these specimens studied

Antennal Segments. Table A.

Localities and Food Plants.	1	2	3	4	5	6	7	8	Size of the ♀ Scales.			
On sycamore, Atlanta, Georgia.												
(W. M. Scott, 1900.)	40	48	60	44	32	24	20	40	6½	mm. long.	6	broad.
On oak, Tifton, Georgia.												
(W. M. Scott, 1900.)	40	64	80	72	40	40	32	48	7½	" "	6½	"
On elm, Atlanta, Georgia.												
(W. M. Scott, 1900.)	40	48	76	56	40	28	32	44	6½	" "	5–4	"
On viburnum, Lawrence, Mass.												
(G. B. King, 1898.)	40	52	76	60	36	32	28	48	7	" "	5½	"
On viburnum, Cambridge, Mass.												
(G. B. King, 1900.)	40	52	80	56	36	32	28	48	7	" "	5½	"
On small tree in deep wood, Andover, Mass.												
(G. B. King, 1899.)	40	48	68	60	28	28	28	48	7	" "	5½	"
On meadow-sweet, Methuen, Mass.									6½	" "	6	"
(G. B. King, 1898.)	40	56	80	72	40	20	24	52	7	" "	5½	"
On grape-vine, Lawrence, Mass.												
(G. B. King, 1897.)	40	48	60	56	36	24	24	40	7	" "	5½–6½	"
On sumach, Dracot, Mass.	40	40	76	52	28	24	24	48	7	" "	5½	"
(G. B. King, 1897.)	36	40	80	60	36	28	28	44	8	" "	6	"
On poplar, East Las Vegas, N. M.												
(T. D. A. Cockerell, 1899.)	40	40	66	60	44	36	20	44	7	" "	5½	"
On honey locust, East Las Vegas, N. M.												
(T. D. A. Cockerell, 1899.)	40	40	64	48	44	24	24	40	7	" "	5	"
On virginia creeper, East Las Vegas, N. M.									6½	" "	4½	"
(T. D. A. Cockerell, 1900.)	40	52	84	64	40	28	24	48	7	" "	5	"
On maple, Wisconsin.												
(Div. of Entomology.)	40	52	64	52	40	24	28	40	5½	" "	5	"
On maple, Washington, D. C.												
(Div. of Entomology.)	40	40	60	52	32	28	28	44	7	" "	5½	"

Front Legs of the Same Species. Table A.

	Coxa.	Femur with trochanter.	Tibia.	Tarsus.	Claw.
On sycamore, Atlanta, Georgia.	80	180	120	80	24
Broad.	80	40	24	16	
On oak, Tifton, Georgia.	80	176	164	80	"
On elm, Atlanta, Georgia.	100	200	160	80	"
On viburnum, Cambridge, Mass.	120	176	164	80	"
Broad.	80	40	24	26	
On small tree in deep wood.	80	172	140	68	
Broad.	80	48	20	16	"
On meadow-sweet, Methuen, Mass.	120	200	160	80	"
Broad.	84	50	28	24	"
On grape, Lawrence, Mass.	100	180	152	80	"
Broad.	80	60	32	20	
On sumach, Dracot, Mass.	98	168	140	80	"

Marginal spines.	Large spines of lateral cleft.	Small spines of same.
32 long	80	40
40 "	108	40
36 "	106	40
40 "	92	32
52 "	108	44
44 "	120	40
36 "	92	40
36 "	88	28
36 "	84	48

were so small, the color and texture of the scales also so variable that with the variation of the antennae and legs, I had a very strong conviction that they should be separate and describe as subspecies; but certain structural characters, which are without doubt specific, being found in all of the material studied, they must be called forms of the same species. Whether these small forms are due to certain food, locality, season of the year being cold or warm, wet or dry, or the part of the food-plant upon which they were found, are all suggestive questions and have been carefully considered.

ANTENNAL SEGMENTS. Table B.

Localities and Food Plants.	1	2	3	4	5	6	7	8	Size of the ♀ Scales.
On maple, Chicago, Ill.	40	40	60	44	32	20	20	44	
(Div. of Entomology.)	36	40	72	48	32	20	20	44	3 mm. in diameter.
On coliseum ivy, Springfield, Mass. (Geo. Dimmock, Sept. 30, 1899.)	40	48	60	60	40	28	24	44	$4\frac{1}{2}$ mm. long. 3 broad
On white thorn, Methuen, Mass. (G. B. King, June 18, 1897.)	40	40	56	48	32	20	20	44	4 " " 3 "
On *Deutzia crenata*, Lawrence, Mass. (G. B. King, June 28, 1898.)	40	40	52	44	32	24	20	44	4 " " 3 "
On *Spiraea*, Lawrence, Mass. (C. B. King, June 10, 1897.)	40	40	48	48	28	20	20	40	5 " " 4 "
On tree in deep woods, Dracot, Mass. (G. B. King, June 8, 1899.)	40	40	64	52	36	28	28	44	5 " " 5 "
On cork oak, Methuen, Mass. (G. B. King, June 12, 1898.)	40	40	68	40	32	28	20	40	$5\frac{1}{2}$ " " $5\frac{1}{2}$ "
On dogwood, Methuen, Mass. (G. B. King, June 26, 1898.)	36	40	60	48	32	24	24	48	$3\frac{1}{2}$ " " $2\frac{1}{2}$ "

FRONT LEG OF SAME. Table B.

		Coxa.	Femur with trochanter.	Tibia.	Tarsus.
On maple Chicago, Ill.	Length.	80	168	128	80
On coliseum ivy, Springfield, Mass.		100	180	140	80
On white thorn, Methuen, Mass.		80	160	140	80
	Broad.	80	60	28	24
On *Spiraea*, Lawrence, Mass.		80	180	160	80
On cork oak, Methuen, Mass.		80	168	128	80
	Broad.	80	60	32	24
On dogwood, Methuen, Mass.		100	160	120	84
	Broad.	80	64	40	24

Marginal spines.	Large spines of lateral cleft	Small spines of same.
28 long	80	32
36 "	"	"
32 "	"	28
40 "	"	40
32 "	"	40

The scales on white thorn were found August 18, 1898, upon the large branches. Those on Spiraea, June 15, 1897, upon the trunk and limbs. The scales on Coliseum ivy, Sept. 30, 1899. Those in the woods, June 16, 1899, on the large branches, on dogwood, June 10, 1898, were on the trunk, on maple at Chicago, Ill., August 10, 1900, and those on meadow sweet, June 25, 1897, on all parts of this small plant. It cannot be said that these forms are only occasional, or at all local, neither that they are found on a particular plant, and in such a position as not to get a full supply of nourishment; moreover I do not remember that the years in which they were found were exceptional. For convenience and also for future reference, I have prepared a separate table of these small forms marked, B. The characters to be observed in the determination of the species are:

Antennae 8-jointed, 3 and 4 longest: 5 always longer than 6 or 7 (the length of the fifth joint is very important) which are variable in length, although often equal and always the shortest. The short spine-like hairs of the first joint normally three, but often only two will be seen. The short spine-like hairs on the outer margin in front of the large blunt spines are also present with the long thin hairs between the antennae, and above the anal plates. The color and size of the scales counts for nothing, as there is every gradation in color from a light red-brown to almost clear black. And it should be said that the length of the first joint is only approximative, as in only a few instances can a specimen be mounted that will show this joint perfectly.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Sciagraphia heliothidata Guenée. According to Dr. Hulst this species has the following synonymy: *ocellinata* Guen., *restorata* Walk., *subcolumbata* Walk., *duplicata* Pack. The larva has not been previously described.

Egg. Elliptical, well flattened above and below, one end slightly depressed, the other rounded truncate and a little swollen. Shining dark grass-green, almost olive color. Densely, finely reticulate, the cell areas concave, and, on the micropylar end, becoming large and strongly concave, look like the markings on a thimble, which is the cause of this end looking swollen. Size .6 × .4 × .3 mm. Later turned dull dark red with central dark green nucleus. Hatched in five days.

Stage I. Head rounded, slightly bilobed, brownish luteous, ocelli black; held obliquely erect; width about .3 mm. Body moderate or rather thick, the incisures distinct; feet normal, pale. Uniformly sordid velvety olivaceous tinted, the tubercles rather large, slightly elevated, dusky. obscure. Dorsum and venter shaded, somewhat darker than the sides; no marks except a faintly traced brownish subdorsal line. Setae short, dark. Later became sordid green from the food, with faint traces of narrow brown line on dorsum and a subdorsal line, which widens into a spot on joint 6.

Stage II. Head slightly bilobed, higher than wide, erect, free; dull luteous greenish, ocelli black; width about .5 mm. Body moderate, the central segments not much elongated; tubercles rounded and slightly elevated, concolorous; setae short, dark. Translucent yellowish, food green, very finely brown dotted, the dots forming obscurely many longitudinal lines. A large brown spot laterally on joint 6. The brown is heavier ventrally, forming a distinct shade, likewise divided into ill-formed lines. Feet normal, the anal pair triangular, not exceeded by the anal plate, immaculate.

Stage III. Head rounded, slightly bilobed, flattened before, higher than joint 2, but held obliquely; pale luteous, faintly brownish mottled, whitish on the eyes and margin of cheeks; width .75 mm. Body moderate, cylindrical, smooth, the incisures folded. Tubercles obsolete, but the setae rather long, black, all distinctly visible, i to viii; ia to iib of thorax evenly separated; pointed and black, both on head and body. Green, mostly by transparency, seen without a lens marked only by the large brown spot on joint 6, which rests on top of the spiracle; with a lens very faintly longitudinally whitish lined, the lines separated by pale brownish dottings, heavier ventrally. Abdominal feet concolorous; thoracic ones blackish shaded. The white lines are dorsal, subdorsal, lateral, stigmatal, subventral and ventral, the two latter the most obscure.

Stage IV. Head rounded, slightly bilobed, clypeus a little depressed, free, oblique; green, faintly purplish mottled; width 11 mm. Body moderate, segments slightly moniliform, a little roughened by the distinct, concolorous tubercles. Setae rather long, black. Green, obscurely dotted-lined with white in dorsal, subdorsal, lateral, suprastigmatal lines; tracheal line yellowish; following this a subventral line, all alike, narrow. A dark brown spot edged with clouded paler brown above the spiracle on joint 6. Thoracic feet, brown dotted. Shields concolorous, not cornified, weakly lined. Incisures of joints 5 to 9 folded, whitish.

Stage V. Head rounded, held obliquely flat, clypeus slightly elevated, paraclypeal pieces not reaching the vertex; green, mottled and streaked with white, tips of mouth parts slightly brownish; width 17. mm. Body moderate, normal, anal feet triangular with small posterior point bearing a seta shorter than the subanal prongs. Tubercles small, setae distinct, brown. Body green, a dark green dorsal band with central broken white line; subdorsal band broad, greenish white, obscurely dotted and triplicate. Two faint broken whitish lines above the spiracle, one on stigmatal fold, two in subventral space, with traces of still paler ones between the latter and as mediοventral line; all obscure and broken into dots. A brown patch above the spiracle on joint 6. Spiracles pale ocherous. Thoracic feet of joint 10 shaded with vinous. No discolorous shields. Central incisures folded, yellowish.

Pupa in the earth, shining brown, not peculiar.

Food plant locust (*Robinia pseudacacia*). Larvae from Washington, D. C.; eggs June 20, mature larvae July 8.

PSYCHE

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[Established in 1874]

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CONTENTS

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[Entered as second class mail matter]

PSYCHE.

STUDIES FOR STUDENTS.

I.

THE ANATOMY OF THE LARVA OF THE GIANT CRANE FLY (*Holorusia rubiginosa*).

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIF.

PREFATORY NOTE.

It is the writer's intention to present under the title "Studies for Students" a series of short papers which shall offer to students an introduction to work in certain of those phases of insect study which are likely to be neglected by amateur entomologists, especially those who have not been members of collegiate classes in zoology or entomology.

There will be presented in each paper a small piece of work in the study of insect structure, development or physiology, in such a manner as to serve as a practical exercise or lesson which can either be directly repeated by the entomological student without other professional instruction, or can be used as an example and reference for the performance of similar work with some other species of insect. In the case of each of these papers (which will appear irregularly) the actual facts recorded will be new, i.e., the result of observations not heretofore recorded. Thus these papers may have a value to entomologists who are not specially interested in a "guide for self-instruction." The strictly technical directions to students will be enclosed in brackets.

It has long seemed to the writer that the almost exclusive attention of most amateur entomologists (and amateurs constitute the great majority of the total number of entomologists) to systematic work, the finding, preserving, identifying and describing of species, is a fact to be deplored. There is so much that is interesting and profitable to be studied in the structure, development and ecology of insects, that it is a pity that the systematic phase of insect study should monopolize such a large proportion of the work of the whole body of entomologists. It is with the thought that a few examples of the other phases of entomological work put into a sort of teaching manner may perhaps help some amateurs to make a beginning in other lines than the purely systematic one that these "Studies for Students" are written.

ANATOMY OF THE LARVA OF HOLORUSIA RUBIGINOSA.

The larvae of the Giant Crane-fly,*

* The immature stages of *Holorusia rubiginosa* have not hitherto been referred to in print. The life-history of this largest known Dipteron with a description of the immature stages will be made the subject of a brief paper in some future number of PSYCHE.

Holorusia rubiginosa, are found abundantly in a slime composed of decaying leaves and soil and water on the banks of Adalanta Creek near this University (Stanford). The larva is so large, full-grown specimens averaging about 2 to 2½ inches in length, and the character and disposition of its internal organs so readily and certainly made out in dissection, that it is chosen as subject for a short study of internal insect anatomy. As *Holorusia* does not occur elsewhere in the United States than on the Pacific Coast (as far as is known) students in other regions will have to use the larva of some other Tipulid species. Some rather large Tipulid is common in almost every locality, and the use of another species than the one whose structure is here described will make the work to some extent comparative in character and thus be even more instructive and interesting than if the same subject could be * used. The account of *Holorusia* will be found to answer as a guide to the dissection of any other Tipulid larva.

External Anatomy (Fig. A).

Technical note. Bring a number of the larvae of some large Tipulid species (found in vegetable slime, or about grass roots in pastures, etc.) alive into the laboratory. Note the various motions and the locomotion of the body. Kill specimens by dropping into boiling water. After the specimen has straightened out and stiffened, requiring about a minute, (death is almost instantaneous) remove to 30% alcohol. After two or three hours remove to 50% alcohol, and after three hours into 70% alcohol. After twelve to twenty-four hours remove to 85% alcohol, in which keep the specimens.

[Verify the following statements if *Holorusia* is used; if another Tipulid is used compare conditions with those here described.] The body is composed of thirteen *segments*. Retracted into the first and second segments is the *head*, with strongly chitinized capsule. At the anterior end of the head, usually projecting slightly, are the short cylindrical unsegmented *antennae* and the strongly chitinized biting *mouthparts*. (The mouthparts can be better examined after the internal anatomy has been studied and the retracted head wholly exposed.)

The hindmost body segment bears terminally on a flat surface two large dark *spiracles* (breathing openings) surrounded by six backward projecting flexible lobes. On the ventral surface of this segment is the *anal opening* of the alimentary canal, on an elevation bearing four large and two smaller flexible processes. The segments of the hinder half of the body have each a median transverse construction; those of the anterior half are difficult to distinguish from one another, but it is assumed that each pair of the lateral

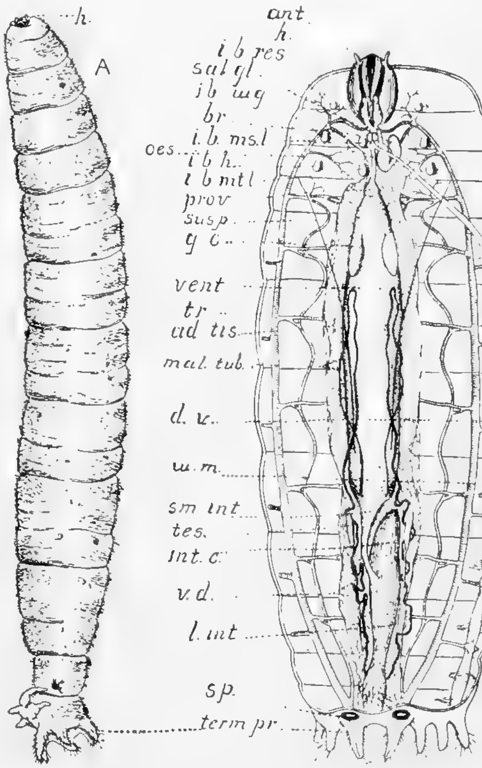
* I shall be glad to send to any one, two specimens of *Holorusia* larvae, properly killed for dissection, if the postage and actual cost of the wooden mailing bottles, amounting to about (?) cents, are paid by the applicant.

groups of *setae*, of which five pairs may be noted, represents a segment. The absence of all paired appendages back of the head is to be noted. [Make a drawing of the whole body of the larva from a lateral aspect.]

Internal Anatomy. (Fig. B.)

[*Technical note.* With fine scissors cut open the body along the median line of the dorsum, cutting through only the body wall. Put the specimen in a* dissecting dish, pin out the cut edges with ribbon pins, and cover with water.]

Alimentary canal and accessory parts. The *alimentary canal* extends through the middle of the body cavity, nearly wholly enclosed, in a thin perforated sheet of fat, *adipose tissue.* The canal consists, first of a slender tube, the *oesophagus*, embraced by the *circumoesophageal nerve commissures* and the *brain lobes;* second, of an abruptly dilated conical portion, the *proventriculus;* third, of a portion immediately behind this and not sharply marked off from it, the elongated *ventriculus*, bearing at its anterior end four elongated pouches, the *gastric caeca.* In the sheet of adipose tissue surrounding the ventriculus several slender convoluted tubules may



Holorusia rubiginosa.

A, larva. B, dissection of larva, showing all organs except the muscles and ventral nerve chain. *h*, head; *ant.*, antenna; *i. b. res.*, imaginal bud of pupal respiratory tube; *i. b. wg.*, imaginal bud of wing; *i. b. ms. l.*, imaginal bud of mesothoracic leg; *i. b. h*, imaginal bud of balancer; *i. b. mt. l.*, imaginal bud of metathoracic leg (the imaginal buds of fore legs are concealed by head capsule); *sal. gl.*, salivary gland (the other salivary gland is removed); *br.*, brain; *oes.*, oesophagus; *prov.*, proventriculus; *susp.*, suspensorium; *g. c.*, gastric coecum; *vent.*, ventriculus; *tr.*, trachea; *ad. tis.*, adipose tissue; *mal. tub.*, Malpighian tubule; *d. v.*, dorsal vessel; *w. m.*, wing muscles of pericardium; *sm. int.*, small intestine; *tes*, testis; *int. c.*, intestinal caecum; *v. d.*, vas deferens; *l. int.*, large intestine; *sp.*, spiracle; *term. pr.*, terminal processes.

* For a dissecting dish use a shallow tin dish, about 5 inches long, 3 inches wide and 1 inch deep, into which melted paraffine has been poured to a depth of ½ inch and allowed to cool. On the smooth surface of the paraffine specimens may be pinned out with short pins and covered with water. Always dissect under water, as the water holds up the loosened parts.

be noted; these are the *Malpighian tubules*, the organs of excretion, four in number. They arise from the alimentary canal just back of the ventriculus at a part marked by a pale transverse line. Behind this line is a fourth part of the alimentary canal, the *small intestine*. It is of smaller caliber than the ventriculus and opens into the fifth division of the canal, the *large intestine*, near the anterior end of the latter. The large intestine is largest in front and tapers posteriorly to the very narrow rectal part. That portion of it in front of the point of entrance of the small intestine may be called the *intestinal caecum*.

The *salivary glands* lie one on each side of the oesophagus. Each is a U-shaped organ with the two arms greatly dilated, and the inner reaching a little farther forward than the outer. The *salivary duct* arises from the outer lobe; the two ducts anteriorly unite beneath the oesophagus, and the common duct thus formed opens into the mouth cavity. [Without removing the alimentary canal make a drawing of it as seen from one side; also make a drawing of the salivary glands and their ducts.]

[Remove a piece of salivary duct to a drop of water on a glass slide without a cover glass. Examine with low objective of compound microscope. Notice transverse lines. Press on two places of the duct with dissecting needles and pull gently apart a very short distance. Examine again under the microscope. The two parts will probably be connected by a spiral thread; this will be seen to be what formed the transverse lines; it is really a spiral thickening of the walls.]

[Remove a small piece of fat to a drop of water on a glass slide. Examine with low power objective. Make a drawing showing the fenestrated structure, the definite outlines, as if the whole were enclosed in a delicate transparent case, and the small spherical bodies — the fat cells — within. Put on a cover glass and examine with the higher power objective.]

The respiratory organs. Lying along each side of the body is a main longitudinal *trachea* (air-tube). Each arises from one of the large posterior spiracles and in each of the third to the ninth segments forward gives off a large branch to the alimentary canal and a smaller one to the dorsal blood vessel (see below). [Make a drawing of the tracheal system, tracing the longitudinal vessels as far forward as possible.]

[Cut off a piece of one of the lateral tracheae and remove it to a drop of water on a glass slide under a cover glass. Examine it with the lower power of the compound microscope and notice the tubular appearance and transverse striations as in the salivary duct. The spiral nature of the thickening is not so easily shown as in the other case but it is characteristic of all insect tracheae.]

The reproductive organs. These consist in the male of two small white oval glands, the *testes*, lying one on each side of the large intestine imbedded in the muscles of the tenth segment, and of a delicate duct, the *vas deferens*, running posteriorly from each to the ventral wall of the penultimate segment. The *ovaries* (of female specimens) are larger and more elongate than the testes and the *oviducts* (corresponding to the vasa deferentia) are more easily seen.

[Make a combined drawing showing the alimentary canal, salivary glands, tracheal trunks and reproductive organs in position in the body].

The nervous system. Remove the alimentary canal cutting the oesophagus across near the front end of the proventriculus. The *brain* is composed of two conspicuous white lobes united posteriorly lying above the oesophagus. The *sub-oesophageal ganglion* lies beneath and just below the oesophagus, and is connected with the anterior end of the brain lobes by the circum-oesophageal commissures. Back of the sub-oesophageal ganglion is a chain of four closely connected ganglia. The next ganglion is far removed from the fourth, lying in the sixth segment and is connected with the preceding and following ganglia by long slender commissures. Following the fifth ganglion are five others similar to it, each lying over the center of the sternal part of a segment. Each ganglion gives off four very conspicuous *nerve trunks;* one on each side arising from the middle of the ganglion going to the muscles of the body wall, and another arising from the anterior end of the ganglion going to the viscera. The last ganglion, lying in the antepenultimate segment, in addition to the four lateral trunks gives off from the posterior side two large divergent ones caudal to the two following segments. [Make a drawing of the nervous system.]

The muscular system. Along each side of the dorsal and the ventral median line of the body is a wide band of longitudinal *muscles.* The most conspicuous fibers reach from the exterior to the posterior border of each segment, but the others reach from either end to the middle, while others extend from the middle of one segment to the middle of the preceding or following segment, while still others are attached to various points of the body wall between the attachments of the sets already mentioned. Finally there is an innermost set of lateral transverse muscles in the anterior half of each segment. [Make a drawing showing the musculation of two successive segments.]

[Remove a bit of muscle to a glass slide and examine it with the compound microscope. Note the transverse striation].

The circulatory system. [Cut a second specimen open longitudinally along the median line of the venter, reserving the first specimen for some later work. Pin the cut edges out. Note again the general disposition of the body organs, so far examined. Examine again the reproductive organs; the specimen may be of the other sex from that previouslystudied. Remove the alimentary canal.] The *dorsal vessel* or heart is a slender, delicate membranous tube composed of a number of parts or chambers lying along the median line of the back. [To see this well cut out the median dorsal strip of body wall carrying the heart and transfer it to a glass slide. Cover with water and examine first under the simple microscope and then under the low objective of the compound microscope.] It will be distinctly seen that toward the middle of each segment, from the last to the third inclusive, the tube becomes dilated and in most of these swellings except the last a pair of internal valves may be seen. From the anterior of these a straight anteriorly tapering tube, the *aorta*, extends forward into the head where it ends in branches. [Make a drawing of the heart and aorta.]

Attached to each dilatation of the heart are two fan-shaped groups, one on each side, of very delicate muscle fibers, called *wing muscles* from their shape. The convergent outer ends are attached to the body wall on the line of the median constriction in each segment. These muscles are easily seen under the compound microscope.

The imaginal buds of wings and legs. [Returning to the first specimen (that opened along the dorsum) carefully remove the muscle fibres from the body wall of the three front (thoracic) segments of the body, not including the head. Be careful not to pick away certain small whitish bud-like bodies lying between the muscles and the body wall.] In specimens of sufficient age the *imaginal buds* of the wings and legs and of the external prothoracic respiratory tubes of the pupa may be seen as small sac or bud-like bodies lying against and attached to the inner surface of the body wall of the thoracic segments. There are two pairs of these imaginal buds in each thoracic segment corresponding respectively to the prothoracic legs of the imago and prothoracic respiratory tubes of the pupa, the mesothoracic legs and wings of imago, and the metathoracic legs and halteres of the imago. The morphology and development of these imaginal buds will be the subject of the next paper in this series.

The head sclerites and mouthparts. [After finishing the dissection of the internal organs remove the head entirely from the rest of the specimen and examine under the simple microscope]. Each of the short antennae arises from a small lobe on the plate covering the top of the head. This plate is long, tapering and decurved behind. Anteriorly along its sides it is united with the lateral plates, while the anterior margin is reentrant receiving the smaller end of the pear shaped *labrum* (upper lip). The distal part of this sclerite is membranous except for two lateral chitinizations. Posteriorly it is fused with the *epicranial plate.* The lateral plates are each oval, shell-shaped, having their anterior lower angles produced forward and united with each other. The single process thus formed projects forward and curves upward between the faces of the posterior jaws. The tips are provided with graduated teeth. In the front of each large lateral plate is a narrow dorso-ventral sclerite carrying the jaws. These are two in number on each side. The anterior one (the *mandible*) is large, strong, toothed terminally, and provided on the inner side with a large, softer, movable lobe. The posterior jaw (the *maxilla*) is less chitinous than the other; it is flat and provided at its outer angle with several papilla-like processes.

GYNANDROMORPHISM IN A NEW SPECIES OF HILARA.*

BY AXEL LEONARD MELANDER, AUSTIN, TEXAS.

While collecting insects in Western Wyoming during September, 1895, Dr. Wm. M. Wheeler chanced upon a very remarkable fly. This insect, *Dilophus tibialis* Loew, was taken among sweepings from the high grass along the borders of Hunter's Creek, at an altitude of about 8000 feet. The specimen was abnormal in the possession of an antennary appendage arising from the right fore coxa. Concerning this curious outgrowth Dr. Wheeler has already published a full account.†

With the same sweepings in which the *Dilophus* was taken were numbers of an undescribed species of *Hilara*, and among these was another abnormal specimen. As cases of malformation are rare, and especially so among insects, possibly on account of the number of ecdyses which these animals undergo, the occurrence of another teratological fly in the same locality in which the *Dilophus* was taken is of some interest. The specimens collected were stored away until recently, when I undertook to study them in connection with the other species of *Hilara*.

Like most members of the genus *Hilara*, the new species exhibits striking sexual dimorphism, that is, apart from the peculiar hypopygial modifications, the first joint of the fore tarsi is greatly enlarged in the male, while of normal shape in the female. This character, which is well-nigh universal in the genus, is, like other secondary sexual characters, subject to considerable variation in form and size among the various species, and is therefore of taxonomic importance.

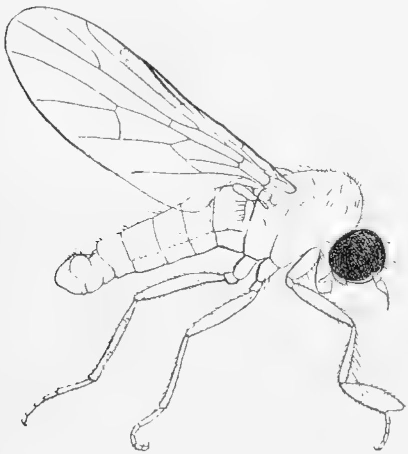
On sorting the Wyoming specimens with regard to the separation of the sexes, an individual was discovered which, so far as external characters are concerned, is neither a male nor a female. This specimen has the abdominal styles of the female, while at the

*(Contributions from the Zoological Laboratory of the University of Texas. No. 18).

† Archiv fuer Entwickelungsmechanik der Organismen. III. Band, 2 Heft, 1896.

same time the front legs are modified as in the males. In other respects it is normal. Thus the front part of the body resembles the normal male, while the abdomen is exactly like that of the female. This case may be called " tandem " hermaphroditism. The figure illustrates the anomaly, together with the condition in a normal male, and a front leg of a normal female.

Although gyandromorphism is by no means unknown among insects, it nearly always occurs in the form of lateral hermaphroditism, as observed more commonly among Lepidoptera and less so among bees and ants. The occurrence of antero-posterior, or " tandem " hermaphroditism is rather rare, although quite as interesting as other cases of blending of sex. In this connection "Hahnenfedrigkeit" among female birds may be recalled.



Hilara wheeleri n. sp. Male.

As this species of *Hilara* has not been described, its diagnosis may properly be given in this connection.

Hilara Wheeleri *sp. nov. Male and female.* Length 3.5 mm. Opaque true-black, covered with a very fine grey-glaucous coating. Head, thorax and abdomen with a few pale short hairs besides the dark bristles. Antennae black, short, third joint short, conical, its arista equal to itself. Palpi testaceous, with pale hairs: proboscis piceous, generally less than one-half the head-height. Thorax not vittate, its short hairs irregularly,

Hilara wheeleri n. sp. Gynandromorphic individual. The detached leg is the fore leg of a normal female.

almost serially arranged: scutellum with four bristles, the inner pair long. Abdomen opaque black, most often compressed in the male and cylindrical or depressed in the female: no conspicuous bristles, the short sparse pubescence pale: hypopygium not of greater depth than the abdomen, sessile, rarely distinctly separated from the abdomen above, compressed, its lateral valves sub-glabrous, the dorsal filament thick, but almost always hidden. Legs fuscous to piceous. The males, as a rule, have the legs darker, but the fore tibiae are always fuscous. The pubescence is pale yellow: no conspicuous macrochaetae are present, though the hairs of the upper edge of the male fore tibiae are longer. The middle and hind coxae are black, the fore coxae more or less fuscous: tarsi black, the remainder of the legs variable in color from fuscous to piceous. The front metatarsi of the male enlarged, ovoid, the distal third of the inner side is excised for the reception of the remainder of the tarsus, which thus is not attached at the tip of the metatarsus. The front tibiae of the males are somewhat thickened. Wings cinereous-hyaline, stigmal spot faintly brown, neuration normal.

Seven males, twelve females and the gynandromorphic specimen.

Dubois (IX. 6, 1895) and Little Wind River (IX. 2, 1895) Wyoming.

This species seems to be allied to *seriata*, Loew, of the Eastern States, which also has ovate metatarsi in the males. As Dr. Loew does not mention the place of articulation of the second joint, it may be presumed that it is terminal to the metatarsus as in the other forms of the genus. Moreover, the middle tibiae of the male *seriata* are provided with rather long pubescence, a character not observable in *Wheeleri*.

A NEW COCCID ON ROOTS OF RUBUS.

BY T. D. A. COCKERELL.

Phenacoccus rubivorus, n. sp. — ♀ — Hemispherical, with the form of a half-pea, distinctly segmented, pale pinkish, thinly covered with white mealy secretion; no cottony appendages. Boiled in liquor potassae, they stain the liquid amber yellow, and the skin becomes colorless. Anal ring with 6 hairs. Caudal tubercles very low and inconspicuous, with short bristles. Legs and antennae very pale brownish; claw with a small denticle on inner side; digitules slender, with small knobs. Antennae 9-jointed, formula approximately 92(35)6(471)8. The following measurements are in μ:—

Antennae segments; (1.) 36, (2.) 51, (3.) 48, (4.) 39, (5.) 45, (6.) 43, (7.) 39, (8.) 30, (9.) 69. Middle legs; femur + trochanter, 222; tibia, 174; tarsus, 90; claw, 27. Of course these measurements will vary, no two individuals being exactly alike.

The females studied contained very well-developed embryos. These showed small spines, round glands, and a small patch of spines on each lateral margin of each segment.

Hab.— Beulah, New Mexico, about 8,000 ft. alt., end of March, 1901, on roots of *Rubus strigosus*. Collected by Wilmatte P. Cockerell.

This interesting species does not have the superficial appearance of a Phenacoccus, though the antennae and legs are as in that genus. I suspect that when we know the male it will turn out to be congeneric with the little-known European *Tetrura rubi* described by Lichtenstein, concerning which see *Entomologist*, 1900, p. 86.

A NEW SPECIES OF CHRYSOPA FROM TEXAS.*

BY JESSE F. MCCLENDON.

Chrysopa bimaculata, sp. nov. Length to tip of wings 11.5 mm–13.5 mm., alar expanse 21–25 mm.

Mouth short, antenna slightly shorter

* (Contributions from the Zoological Laboratory of the University of Texas. No. 19.)

than the wing; prothorax broader than long; wings moderately narrow, anterior pair slightly pointed, posterior more acutely, in anterior wing divisory veinlet of third cubital areole exceeding the first cross-vein of the first radial sector.*

Face stramineous, vertex green, gular region stramineous, segments of palpi black, their articulations colorless, antennae stramineous, darker towards apex, first article with a red longitudinal line above; thorax green, paler beneath, prothorax with a luteo-rufous streak on each side from anterior to posterior margin; abdomen green; legs pale green, tarsi yellowish, ungues fuscous; wing veins green, in anterior wing all cross veins black or varied with black, in posterior wing costal cross-veins and a few others black, pterostigma light green.

Coloration of alcoholic specimen: green faded to pale yellow, line on first article of antennae fuscous, streak on prothorax faded out, black retained.

Four specimens from Laredo, Texas. August, 1900.

* The position of this veinlet has been noted in descriptions of many species of *Chrysopa*, but on examining a number of specimens of *Chrysopa externa*, I found it to vary so much as to be of no value in determining that species. Whether it varies in *C. bimaculata*, I am unable to decide on account of the small number of specimens in my possession.

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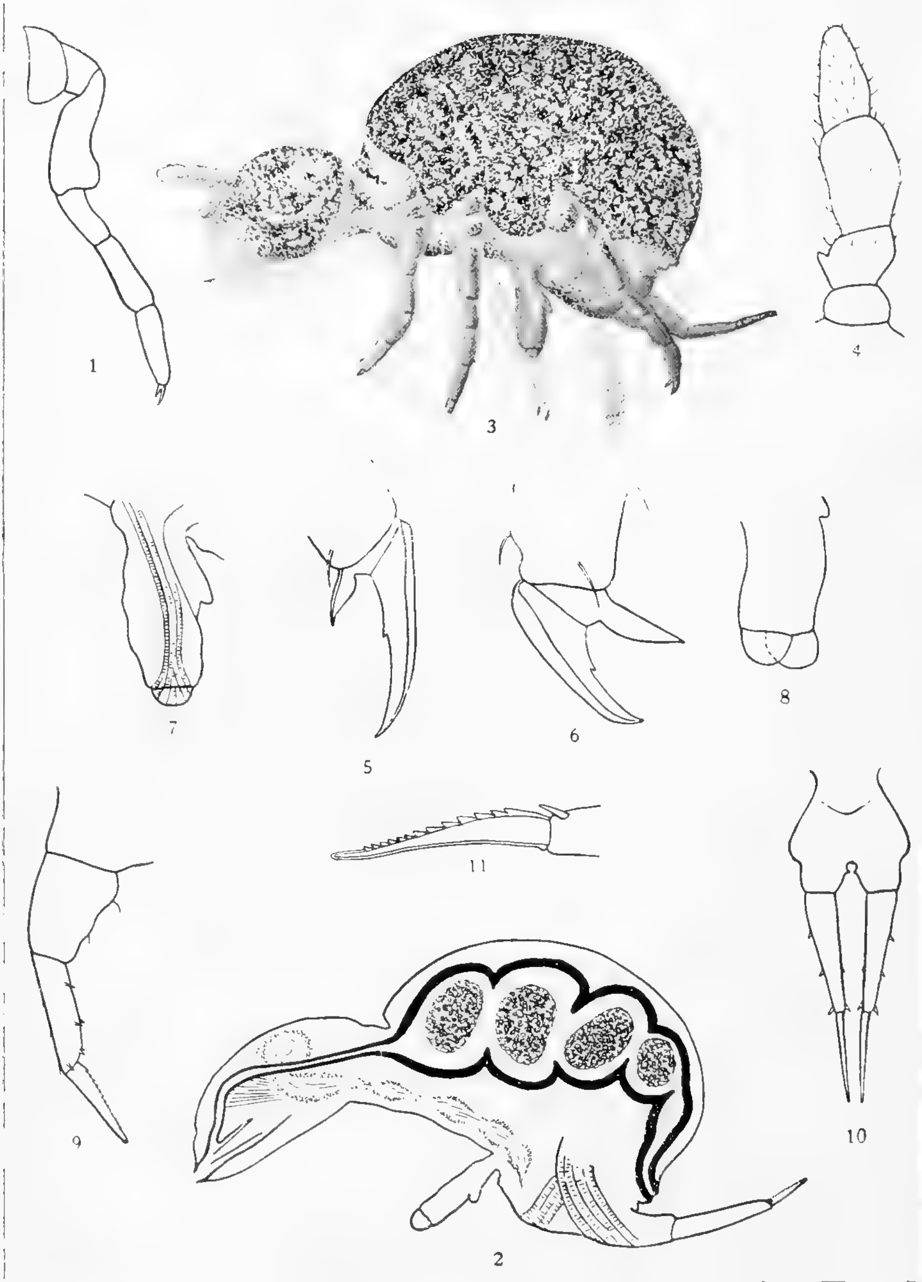
CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.



THE GENUS NEELUS.

PSYCHE.

REVIEW OF THE COLLEMBOLAN GENUS NEELUS AND DESCRIPTION OF N. MINUTUS N. SP.

BY JUSTUS WATSON FOLSOM, CHAMPAIGN, ILL.

The name *Neelus murinus* was given by me* to a curious collembolan that I found in a greenhouse in Cambridge, Mass., under circumstances that indicated Jamaica as its home. The value of the generic characters which I originally drew from a single species is now substantiated through two more forms: "*Megalothorax*" *minimus*, described by Willem† from specimens obtained at the Botanic Garden of Ghent, Belgium, and *Neelus minutus*, a Massachusetts species described below.

The genus Neelus can now be characterized with more detail than it could before, thanks to the additional species. First in importance are the extraordinary development of the thorax, which greatly exceeds the abdomen in length, and the unusual structure of the antennae, as compared with Sminthurus and Papirius — the only other Collembola of globular form. The head is ovate, horizontal or subhorizontal, and broadly articulated. Eyes and postantennal organs are absent. The antennae are short — not more than one half as long as the head — and consist of four simple segments, the second and third of which are incrassate or subclavate. Body globular; prothorax slightly reduced dorsally, mesothorax not reduced, metathorax conspicuously long. Legs long and slender; coxae (fig. 1) especially long; two precoxal segments are evident. Both claws present. The ventral tube is about as long as the antennae and emits a pair of hemispherical papillae. Abdomen swollen before the manubrium; anal tubercle obsolete. Furcula twice as long as the antennae; manubrium stout, distally bifid; dentes cylindrical in lateral aspect; mucrones elongate, serrate or entire. Appendages sparsely clothed with short stiff setae; body almost naked, except anally. Size minute.

Tracheae are apparently absent. The stomach (fig. 2) differs from that of every other collembolan genus in consisting of a longitudinal series of four spherical chambers, partially separated by permanent transverse invaginations of the wall; the intestine, also, becomes spherically, but temporarily, distended by its contents. The food, vegetable detritus, appears through the integument as four or five brown ovoid masses.

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*Folsom, J. W. Neelus murinus, representing a new thysanuran family. Psyche, vol. 7, p. 391–392, pl. 8. 1896.

† Willem, V. Un type nouveau de sminthuride: Megalothorax. Ann. soc. ent. Belg., t. 44, p. 7-10, 1 pl. 1900.

Also, Willem, V. Recherches sur les Collemboles et les Thysanoures. Brussels, 1900. (See p. 65-68 and pl. 15).

The first abdominal ganglion is the last of the chain to be represented and tends to unite with the ganglion of the preceding segment.

As all these generic characters appear, not only in the two species of Neelus found by me, but also in *Megalothorax minimus* Willem, the latter (and later) genus falls. *N. minimus*, unlike the other two species, has three pairs of small cuticular cupules, and the attitude of the head, as figured by Willem, is more nearly vertical — an attitude, however, that occurs at times in the other forms; finally, the segmentation of the body (obscure in *murinus* and *minutus*) is pronounced in *minimus* — a difference also found within the allied genus Sminthurus. With this last genus, Neelus should be compared, although it may be stated at the outset that the differences between the two are much greater than those that separate Sminthurus and Papirius.

As contrasted with Sminthurus, then, the head of Neelus is articulated by its entire base, without a projecting vertex, higher than the neck. The antennae, in particular, instead of being longer than the head and slender, are but half as long as the head and have stout segments, the last of which is not annulate, as it is frequently, although not always, in Sminthurus. The thorax, far from being condensed, with the legs brought together, is much more extensive than the abdomen — an essential difference — and the legs are well separated. The metathorax is remarkably long and the coxae as well. Again, the ventral tube is long, of peculiar form, and does not extrude long filamentous tubes. There is no prominent anal tubercle in Neelus. The stomach is divided into spherical compartments, instead of being cylindrical as in Sminthurus. Other differences, of minor importance, exist but need no mention.

Neelus should, however, be assigned to one family with Sminthurus and Papirius, notwithstanding my earlier opinion, and clearly becomes the most primitive genus of Sminthuridae. In Willem's (1900, p. 67) words:

"*Megalothorax* [Neelus] est un Sminthuride qui a conservé les caractères archaïques suivants:

1. la forme des antennes;

2. le développement du thorax, dont seul le premier anneau a subi une légère régression;

3. la persistance très nette de la segmentation abdominale; [this applies to species *minimus* only, at present.]

4. la netteté des deux articles précoxiens des pattes;

5. la simplicité de l' appareil reproducteur mâle.

C'est donc, sons bien des rapports, le plus archaïque des Sminthurides: il s'est séparé de la souche du groupe avant *Prosminthurus* [of Willem] et *Sminthurus*.

Il offre comme spécialisations secondaires:

a. la disparition des yeux;

b. les trois cupules sensorielles; [applies to *minimus* only.]

c. la diminution de volume de l'abdomen, plus ramassé que chez *Sminthurus*;

d. l' absence d' appareil trachéen;

e. la structure spéciale de l' intestin moyen."

The break between the Sminthuridae

and the cylindrical Collembola is partially bridged by Neelus, which, quite unlike Sminthurus and Papirius, agrees with the Poduridae in respect to the form of the antennae, the articulation and position of the head, and the form of the papillae emitted by the ventral tube.

The three species of *Neelus* may be separated as follows:

Segmentation pronounced; superior claw untoothed, with a basal pair of subulate-processes (*pseudonychiae* of Tullberg); dentes untoothed; mucro sublinear, entire; three pairs of cuticular cupules present, on mesothorax, metathorax and fourth abdominal segments, respectively; brown; maximum length, 0.25 mm. *minimus.*

Segmentation obscure; superior claw unidentate; dentes toothed or spined; mucro lanceolate in lateral aspect, and serrate; cupules absent.

Superior claw with a basal pair of linear processes (pseudonychiae); inferior claw linear-lanceolate; dentes five-toothed; ochraceous-buff; maximum length, 0.7 mm. . *murinus.*

Superior claw not pseudonychiate; inferior claw lanceolate or oblong-lanceolate; dentes six-spined; bluish gray; maximum length 0.56 mm. *minutus*, n. sp.

Neelus minutus I have found at only one spot, an old pine forest in Arlington, Mass., in rich black soil, perennially damp. The species easily escapes ordinary observation on account of its small size and dull color and I took only about two dozen examples during four years of continual search. One specimen occurred under the loose bark of a white oak log; the others were on the under side of dead sticks or else in the soil. Minute white individuals, scarcely discernible, appear early in July; full grown specimens occur in the middle of that month, are most numerous in mid August and persist, in constantly decreasing numbers, even into December, long after the frosts have begun.

Neelus minutus n. sp. (Plate 2, figs. 3–11). — General color bluish gray, — the combined effect of bluish mottlings and a pale ground color (fig. 3); sternum colored; appendages white, excepting a little color on the bases of the legs of large individuals; the amount of coloration increases with the size, young specimens being white. Head horizontal, ovate. Eyes and postantennal organs absent. Antennae (fig. 4) less than half as long as the head; ratio of segments, 2: 3: 6: 5; second segment incrassate, simple or with a ventral lobe; third incrassate; fourth conical. Body oval in dorsal aspect, with smooth contour, showing scarcely a trace of segmentation above. Thorax one and one half times as long as the abdomen. Claws small; first and second pairs of superior claws (fig. 5) slightly curved, uniformly tapering, unidentate; first pair of inferiors lanceolate, simple, one third as long as the opposed claws; second pair similar but a little longer; third pair of superior claws (fig. 6) broad basally, unidentate; third pair of inferiors oblong-lanceolate, simple, extending almost as far as the opposite claws; pseudonychiae absent. Ventral tube (figs. 3, 7, 8) subclavate with a posterior lobe near the base. Manubrium (fig. 9) stout, slightly shorter than the dentes, bifid (fig. 10); dentes in lateral aspect (fig. 9) cylindrical, in dorsal view (fig. 10) tapering, with two mesal and four lateral spines; mucrones (figs. 9–11) five sixths as long as the dentes, lanceolate from the side, linear from above, serrate with entire apex. Head and body naked, excepting a few stiff anal setae; appendages sparsely clothed with minute stiff setae. Maximum length, 0.56 mm.

Described from twenty-one types, some of which have been given to the Museum of Comparative Zoölogy at Cambridge, Mass.

EXPLANATION OF PLATE II.

Neelus murinus.

Fig. 1. Left aspect of left hind leg, × 118.
Fig. 2. Diagram of a sagittal section showing the peculiar alimentary canal of the genus, × 118.

Neelus minutus, n. sp.

Fig. 3. Lateral aspect, × 122.
Fig. 4. Lateral view of left antenna, × 506.
Fig. 5. Right aspect of right fore foot, × 1008.
Fig. 6. Right aspect of right hind foot, × 1008.
Fig. 7. Ventral tube as seen from the left side, × 269.
Fig. 8. Ventral tube showing exsertile papillae, × 448.
Fig. 9. Furcula. × 269.
Fig. 10. Furcula, from above, × 224.
Fig. 11. Right aspect of left mucro, × 605.

MICRODON LARVAE IN PSEUDOMYRMA NESTS.*

BY WILLIAM MORTON WHEELER, AUSTIN, TEXAS.

The larvae of the Syrphid flies belonging to the genus Microdon are of peculiar interest to the entomologist both on account of their occurrence in ant nests and because of their remarkable appearance which is more like that of slugs, planarians or scale-insects than Dipteron larvae. In Europe they have long been known to occur in the nests of several Formicidae and even in the nests of Vespa crabro.†

Wasmann‡ records the occurrence of the larva and pupa of *Microdon mutabilis* L. with *Formica fusca*, *F. rufa*, *F. rufibarbis*, *Lasius niger*, *L. brunneus* and *L. flavus*, and of *Microdon devius* L. with *F. fusca*, *F. sanguinea*, *F. rufa* and *L. fuliginosus*. Adlerz§ found a species in the nest of *Camponotus herculeanus*. In the United States Microdon larvae are occasionally found with *Camponotus pennsylvanicus* and *Formica integra*, and a care-

* Contributions from the Zoological Laboratory of the University of Texas, No. 20.

† Wasmann. Vergleichende Studien ueber Ameisengaeste und Termitengaeste Tijdschr. voor Entomol. Bd. 33, 1890.

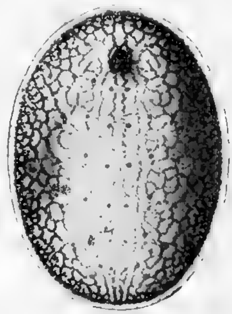
‡ Kritiches Verzeichniss der myrmekophilen und termitophilen Arthropoden. Berlin 1894 pp. 173 and 175.

§ Myrmecologisker Notiser. Entomol. Tidskrift 1896 pp. 131–132.)

ful examination of the literature would probably show that they have also been taken in the nests of other species of Formicidae in this country. Of their occurrence in the tropics, however, little is known. Wasmann (loc. cit.) mentions the larva of one species as occurring in Madagascar with *Camponotus Hildebrandti*, and the larva and pupa of another as having been found in ant nests in Australia. He also records the occurrence of these larvae in termite nests in Madagascar and Porto Alegre, Southern Brazil.

During the Christmas holidays, while collecting ants at Cuernavaca, Mexico, I happened on some Microdon larvae in the nests of *Pseudomyrma gracilis* Fabr. var. *mexicana* Emery, one of the numerous varieties of a tropical ant which seems to be of rather common occurrence from the extreme southwest corner of Texas (about Brownsville according to Townsend,*) to Rio Grande do Sul in Southern Brazil (v. Ihering.†) In one of the Pseudomyrma nests which was in a hollow acacia limb and contained a deälated queen, about a dozen workers and a lot of larvae and pupae, a mature Microdon larva was found attached to the wall of the chamber in the midst of the ants. The other Pseudomyrma nest was in one of the epiphytic Tillandsias.‡ This contained a Microdon puparium from which the fly had already escaped. The anterior third of the pupa-case had been pushed off in the manner characteristic of the Cyclorhapha.

The occurrence of such bulky and defenceless Dipteron larvae in the nests of large-eyed, active ants like the Pseudomyrmas, which are, moreover, provided with powerful stings, is nearly as surprising as their occurrence in the nests of Vespa. Apparently the relations between the larvae and their hosts are the same as those of other species of Microdon larvae to the less formidable ants of Europe and the United States. Adlerz (loc. cit.), who was able to make some observations in Sweden, came to the conclusion that the Microdon larvae subsist on the moist and tender wood, forming the walls of the ant galleries in pine stumps although they were also found in burrows in the dry bark. The ants seemed not to pay the slightest attention to the Dipteron larvae living in their midst. Wasmann § also found that the



Adult larva of Microdon sp., living in nests of *Pseudomyrma gracilis* Fabr. var *mexicana* Em. × 5.

*On the Biogeography of Mexico and the South Western United States II. Trans. Tex. Acad. Sci. 1897. Vol. II No. 1, p. 72.

†Die Ameisen von Rio Grande do Sul. Berlin. Entomol. Zeitschr. Bd. 39. Hett. 3 1894 p. 383.

‡For a description of these singular nests the reader may be referred to my article on "Compound and Mixed Nests of American Ants," Am. Naturalist 1901.

§ Erster Nachtrag zu den Ameisengaesten von Hollaendisch Limburg. Thjdcshr. voor Entomol. Deel 49. 1898 p. 7.

larvae of *Microdon mutabilis* were completely ignored by the ants in a mixed colony of *Formica sanguinea-fusca*. But he observed that the fly, which is covered with delicate yellow pile, was assiduously licked by *F. sanguinea* although it soon died. Except for this last observation, which relates only to its imaginal stage, Microdon may be regarded as belonging to Wasmann's category of synoeketic myrmecophiles, or indifferently tolerated guests, a great company which also comprises the tiny crickets of the genus Myrmecophila.*

The imagines of a number of species of Microdon have been described from North America but they all appear to be rare insects. They fly reluctantly and are fond of lurking about the roots of grasses and other plants in situations where they readily elude the observation of the most careful collector. I am unable to conjecture to which of the described Mexican species the larva observed in the Pseudomyrma nests belongs. The accompanying photograph will enable any future observer to identify it without much difficulty, even if it should be found, as I have no doubt it will be, in the nests of other species of ants in Mexico and Central America.

*See Wheeler, The Habits of Myrmecophila nebrascensis Bruner. Psyche, Oct., 1900. pp. 111-115; and Wasmann, Zur Lebensweise der Ameisengrillen (Myrmecophila). Natur u. Offenbarung. 47. Bd. 1901 pp. 129-152).

NOTES ON THE MATING OF *ATTACUS CECROPIA* AND OTHERS.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

In most of the large collections of *cecropia* cocoons which I have examined the female pupae have outnumbered the male by about five to one, twice by three to one. For this reason I have inferred that the males were polygamous, and this spring I have tested them, as the moths emerged very early.

Close observation has convinced me that the female *cecropia* requires sixteen hours out of the cocoon before she is ready to mate. In no instance did a female protrude the whole ovipositor sooner, and in no instance did the male in the cage with her attempt mating or seem in the least attracted or excited before the protrusion of the whole ovipositor. Partial protrusion occurs earlier.

I feel convinced that there is a different odor diffused when the whole ovipositor is protruded, in the case of all the large Saturniids, and often I think I can detect it in spite of the previous powerful odor of both male and female.

With one exception no female flew or moved about the cage after her wings were expanded until mating had taken place, nor did any female show the least sign of noticing the male or of preference for any male except in one other instance when the female vibrated her wings rapidly after the male had been flying about her for nearly an hour.

The first exception was a female which began flying about a male trying to mate, but for some reason none of three males mated her.

One pair mated at midnight, but no others mated before four A. M., though the males' flying and quivering began sometimes an hour earlier, sometimes less.

Eleven males mated, remained in coition for about sixteen hours, then mated a second female each about eight hours later. No male mated a female which had been mated before, — of this set. One male mated the same female on two successive mornings, she having laid over one hundred eggs in the interval. The male then mated a second female on the next morning, but coition lasted only about eight hours. On the next morning the male mated a third female and remained in coition until near midnight.

The following morning the male mated a fourth female. coition lasting sixteen hours, and this female he mated again the next morning although a fresh one was put in the cage. Coition lasted about sixteen hours the second time also.

The next morning the male mated a fifth female, coition lasting from about 4 a. m. till 7.25 p. m. when the female freed herself by violent struggles. The male was flying about the sixth female within five minutes, and after fifteen minutes of displaying his wings, flying, and quivering, settled down into quiet for the night. At precisely 4 a. m. the male mated the sixth female with no preliminary flight or display except that of the previous evening.

The hour of mating was very near 4 a. m. in every instance, never later than 4.30.

No new female emerged and the next day passed without mating, but on the following morning the male mated the 6th female for the second time. She resisted vigorously and coition was short.

The next day there was no coition there being no fresh female, and the male died, having mated nine times in thirteen days.

The eleven males which mated two females each had no opportunity of mating others as no other females emerged in time. It seems fair to believe that the male *cecropia* is very polygamous.

Three males were in boxes with lace over the tops, and so placed that they could not see the female in the cage. They were perfectly quiet until the female protruded the whole ovipositor when, in less than two minutes, they were flying excitedly about the boxes, stopping only when the female mated with the male in the cage.

From observations with *promethea angulifera*, and *cecropia* it seems that there is some emanation from the ovipositor which attracts the male, and that no male will mate or approach a female without being attracted in this way.

Females of *Samia cynthia* do not protrude the ovipositor as much as do the other Attacine moths, and are far less passive, flying about in as much excitement as the males, and vibrating their wings faster and faster when not flying, quivering all over, and waving their wings in a peculiar manner.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXIII

BY HARRISON G. DYAR, WASHINGTON, D. C.

Xanthotype crocataria Fab. The larva and pupa of this species have been described by Packard, Bowles, French and Forbes, but no complete life-history has been given.

Egg. Laid in patches of six to twenty. Elliptical, flattened, concave on two sides but rounded, wedge shaped from side view, the thick end flattened, subtruncate; shagreened by a minute granulation and with traces of hexagonal reticulations which are indicated only, chiefly by the minute bordering pores which appear as white specks in certain lights. Shining light green. Size .7 × .5 × .3 mm. Later turning rather dark red.

Stage I. Head rounded, slightly bilobed, pale brownish ocherous, a narrow dark line on the posterior angles, not shining, ocelli black; width .3 mm. Body moderate, normal; white, subdorsal and medioventral purple-brown bands, moderate, straight, reaching from joint 2 to 13, the subdorsals a little divergent on joints 2 and 13. Tubercles and setae minute, dark, inconspicuous. Feet pale outwardly; segments faintly annulate, uniform, incisures not marked. Shields concolorous, not cornified. On eating, the color became greenish from the food showing by transparency.

Stage II. Head erect, rather higher than wide but not above joint 2, pale luteous with a blackish stripe on each side across ocelli to near vertex, behind which the color is whitish; width .55 mm. Body normal, a little flattened. Dorsum whitish green, a broad red-brown subdorsal stripe, divergent on joints 2 and 13 to the anal feet; sides green, whitish on subventral fold; a ventral stripe like the subdorsal but single, reaching from the head to joint 13. Feet pale; skin smooth.

Stage III. Head rounded, somewhat flattened before and held obliquely flat; pale greenish, obscurely white streaked vertically, the rather large antennae and a stripe on the sides bearing ocelli white, the stripe faintly dark edged before; ocelli black; width .9 mm. Body moderate, normal, a little flattened; anal plate slightly pointed, anal feet triangular, excavate behind with anal prongs which equal the plate. Light green, four white lines in the dorsum; a subdorsal (or rather lateral) band of smoky brown, fainter than before; a greenish white stripe on the subventral fold; subventer faintly white lined, the brown ventral stripe like the subdorsal in color. Feet pale, tubercles and setae small.

Stage IV. Head rounded, squarish, flattened but convex in front, antennae large; held out quite flat; whitish with green tint, obscurely mottled brighter on the sides, a blackish band on the lateral angle forming a bend at antennae to mouth, crossing ocelli;

width 1.2 mm. Body moderately slender, smooth, subventral fold prominent. Whitish green, dorsum with four narrow white lines; lateral band blackish, geminate, reaching joints 2 and 13, but not continued on the anal foot; subventral fold yellowish white, two white lines in the subventral space. Ventral band blackish brown, composed of four fine lines united by a shading. Thoracic feet brown dotted; abdominal foot of joint 10 lined before and behind, that of 13 with triangular plate produced above into a prong. Anal plate triangular, pointed. Spiracles black ringed, that of joint 2 the largest. Tubercles small, ii slightly larger, blackish. Setae short, stiff, dusky.

Stage V. Head as before, faintly longitudinally streaked with white; lateral band mottled, red-brown, edged with white behind; width 1.9 mm. Body elongate, uniformly yellowish opaque green, shading to whitish green on joints 2 and 13; a faint, more transparent and darker vascular dorsal line showing especially as V-marks between tubercles ii, the point on the posterior edge of the segment. A slightly more opaque subdorsal line below tubercle ii; lateral band reddish brown, obscurely triplicate, nearly obsolete except at the ends, where, especially on joints 10 to 13, it forms a broad diffuse shade; ventral band separated into four lines and obscure except on the thorax between the feet, red-brown. Spiracles white, black edged except on the bottom. Thoracic feet appressed, green, brown dotted. Foot of joint 10 brown bordered. Subventral fold lighter, white posteriorly, running narrowly on the lower part of anal foot. Anal prongs exceeding the triangular plate. There is occasionally a brown form of the larva which is similar but head and all shaded with vinous brown, darkest in the dorsal V-marks, subdorsal line and ventral region, the pale band on subventral fold contrasted.

Cocoon. Leaves spun together and united by a moderate amount of whitish silk.

Pupa. Bright green, somewhat transparent, the abdomen with a whitish green deposit beneath, leaving a dark green vascular dorsal line. Spiracles, eyes and a small semicircular raised disk on each side of the prothorax behind black. End segment and cremaster also black, the latter a thick cone, densely punctured with a group of recurved hooks at the tip. The last segment is sharply wider than the cremaster and its upper edge is roundedly serrate. Surface smooth and shining.

Food plants various. These larvae fed on several species of Polygonum. Double brooded, the second brood hibernating in about the penultimate stage (Ent. News, V, 62) and probably having more than five stages as here recorded for the Spring brood. Larvae from Washington, D. C.

HEMIPTERA ON VERBASCUM—It is always interesting to examine introduced plants, and see what native insects have succeeded in utilizing them for food or shelter. Last July at Las Vegas Hot Springs, N. M., I found the European *Verbascum thapsus* growing plentifully, and three species of Hemiptera very much at home upon it. These latter have been submitted to Mr. E. D. Ball, who identifies them as *Thyanta custator* Fabr., *Neides muticus* Say, and *Lygus pratensis* L.

T. D. A. Cockerell.

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PSYCHE.

SKETCH OF THE HABITS OF NORTH AMERICAN ANTS.*— I.

BY AUGUSTE FOREL, CHIGNY PRÈS MORGES, SWITZERLAND.

Translated by A. P. Morse.

FAISONS, N. C., July 28, 1899.

To the Belgian Entomological Society, Brussels.†

Dear Colleagues:

I am approaching the end of a myrmecological excursion in North America, and find myself here in the hot, low and marshy, almost sub-tropical region of North Carolina (between Goldsboro and Wilmington), under the hospitable roof of my good friend, Dr. Faisons, to whose family the village owes its name. I think that a report of the most interesting of the results I have secured will be welcome to you at your next meeting.

I have visited at Toronto, Canada; Worcester, Mass. (at the home of my friend and fellow-countryman, Prof. Ad. Meyer), Morganton (with my genial colleague, Dr. Murphy, director of the Insane Asylum), Black Mountain, and Faisons,— the three latter localities in North Carolina.

And first, a remark of general character relative to what has surprised me in the highest degree. In North America, with some rare exceptions, the ants do not construct mounds, either of masonry or of other materials.

In Europe, as you know, ant-hills abound in every meadow, in the woods, in clearings, among the mountains. On coming to a country where the fauna is so similar to that of our own, where so many species only differ from ours in characters often but little distinctive, where the tillage, the fields, the woods, closely resemble those of Europe, I was entirely taken aback when I observed that the varieties of our most common species: *Lasius niger*, *alienus*, *flavus*, *Formica fusca*, *sanguinea*, etc., do not build any masonry mound, but live in hidden, subterranean nests, opening only under stones or on the ground-level by a little crater. But the fact is the same from Canada to North Carolina. I was forced to submit to the evidence. However, the Americans know what an "ant-hill" is. When conversing with them, they refer to it as a great rarity which can be found in such and such a forest twenty or thirty miles away. And on going there you find a colony of *Formica exsectoides*, the only species in eastern North America which regularly

* Extract from the "Rivista di Scienze Biologiche," vol. ii, no 3, Como, 1900.

† The first part of this article, as far as the appendix, is taken from the "Annales de la Société entomologique de Belgique," vol. 43, 1899

makes large, elevated conical mounds of earth in the forests. I visited two of these colonies in the vicinity of Worcester and of Black Mountain. The nests open by holes situated at the base and about the periphery. The workers do not make excavated roads like our *rufa* of Europe.

Besides these, *Formica fusca*, r. *subsericea* and *pallidefulva* rarely make small mounds. As for *subsericea*, so common everywhere, I have seen its mounds only at Niagara, at the side of the fall.

After mature reflection I have come to the conclusion that this singular fact does not seriously weaken my theory of the domes, but rather confirms it. In my "Fourmis de la Suisse," I have shown that the elevated dome is used by our ants to collect and concentrate on their larvae the radiant solar heat which they so much need, and I cited a number of facts in support of this view. But the climate of North America is entirely different from ours. Extremely cold in winter, it is burning in summer; there are extremes of which we in Europe have no idea. The ants consequently have quite enough heat and sunlight for their larvae. The dome is superfluous. What they do need is protection from extreme temperatures. For this purpose it is necessary either to mine deeply or to locate themselves in the shade and in the decaying trunks of forest trees. And that is what they do. At least it is in this way that I explain most readily this fact, so surprising by its generality.

Another fact to which Blochmann first called attention in Europe in connection with *Camponotus ligniperdus* is the following: The nests of ants abound above all on hill-slopes facing the east. I have confirmed this statement since then many a time, and here in America again. In this case also the explanation seems simple: The morning sun awakens the ants and urges them to work. After noon it is warm enough, they no longer need the sunshine. Hence the advantage of an easterly exposure which provides for a large amount of daily activity. Toward the west, on the contrary, they would lose the first hours of the morning, would be unable to work on account of the heat after noon in summer, and could do next to nothing in the evening to make up for it, once the night was come. Moreover, the night equalizes very quickly the eastern and western exposures, so that the latter do not even prolong the afternoon's activity among those species which work at night. Ants, then, have every advantage in securing sunshine in the morning and shade in the afternoon — in America as in Europe.

Let us pass on to some particular cases.

The species of *Formica* of Europe have American representatives. To *F. rufa*, *pratensis*, *truncicola* and *exsecta* of Europe correspond *integra*, *obscurifer*, *obscuriventris* and *exsectoides* of America. We have seen that *exsectoides* is the only ant of eastern America which makes large domes. It lives in colonies of five to twenty nests. McCook has seen 1500 to 1600 nests of it. The nests which I have seen were all quite conical and built almost exclusively of earth, with scarcely any commingling of leaves and fibrous debris. Some have a little more woody material. *Integra*, still larger, more dimorphic, of a handsome red with the abdomen ashy black, lives at the foot of trees or decayed trunks, fills the interstices of bark, etc., with woody debris and pine needles which stop up everything, without forming a dome rising above ground. The entire nest is excavated in the earth or in wood. This species rises upon its hind legs, curves the abdomen, like *pratensis* (this is not done by *exsectoides*) and ejects, as far as I have been able to observe, some venom while in this position. Dr. Faisons has shown me in a pine wood here at Faisons a considerable colony of about thirty nests of this species. These nests were connected with each other by tortuous roads quite similar to those of our *F. pratensis* of Europe, but narrower, deeper, and above all almost entirely covered, that is to say, carefully covered over with woody materials similar to those of the nest. Only at certain places were they uncovered for a length of a few centimeters. The fact is very curious and quite new; I think that they try thus to protect themselves from birds and other enemies. These roads lead to the trees and nests. The latter somewhat resemble those of *truncicola* of Europe. *Obscuripes* occurs only in the Far West; I have not yet found *obscuriventris*.

As Emery has shown, our slave-making *Formica*, *F. sanguinea*, is represented in America by several varieties. All those that I have observed at Niagara, Worcester, Morganton, Tyson's and likewise here, attack *Formica subsericea*, often much larger than themselves, and carry off the pupae. All the formicaries which I have observed have a large number of slaves, more than in Europe; the slaves in the nest are often more numerous than the *sanguinea*. I have seen several expeditions and two removals of *sanguinea*. The expeditions take place in the morning and the pupae are carried back in the afternoon. All this takes place as in Europe. I have seen some varieties having the epistoma but little emarginate make as many slaves as others having it deeply emarginate. At Mr. Tyson's (near Black Mountain, at the foot of Mt. Mitchell) when a large formicary of small *sanguinea* changed its nest, the *sanguinea* almost entirely alone transferred the *subsericea*.

The latter, although more numerous, were nearly all in the nest, and allowed themselves to be transported quietly. In the other removal which I witnessed, the case was the same. This is very striking, in America, on account of the large number of slaves, which are as numerous or even more numerous than their despoilers. In the High Park at Toronto I discovered, on the other hand, a large colony of *F. sanguinea* composed of numerous nests (more than a dozen), built against trunks of dead trees or by the roadside, and having not a single slave. These ants, of a deep red color, slightly emarginate, form their nests of rather woody materials, a little like *truncicola*. Their aspect was otherwise exactly like that of other *sanguinea* of Europe and America. They attacked and pillaged a bagful of *subsericea* and *pallidefulva*, which I placed near their nest, exactly as do other *sanguinea*, wild with desire like them, to carry off the pupae. The fact that these insects lived in a populous colony of many nests and had no slaves remains very curious, to say the least.

Formica subsericea, which corresponds to our *fusca* and is only a race of it, lives in the earth and in decayed logs. Only about Niagara have I seen any of its earthy domes, similar to those of its European congener.

Formica pallidefulva and its innumerable varieties excavate their nests in meadows and under stones.

Camponotus pennsylvanicus and *pictus* are very common in trees, the second in the north, the first everywhere. *Pennsylvanicus* runs rapidly on the roads and along the trunks, like our *pubescens* in the Valais. *Pictus* is timid and lives in small colonies in the trunks. *Marginatus* and its varieties live as with us in the bark of living trees, and *castaneus* is found in the ground, in the southern States.

Lasius alienus and *niger* live as with us but with neither domes nor chambers for their aphides. They mine solely and are more retiring, only making here and there little craters of sand. One finds them especially under stones. *Lasius myops* makes no dome at all. It is found under stones. In trunks in the woods is found a large *Lasius* of a dark and dirty yellow, related to *affinis* and making its nest in the worm-eaten wood of the trunks. The *Acanthomyops* make their nests deeply excavated in the fields. One discovers them only at swarming-time. In this way I secured at Morganton a species of it which is probably new.

Prenolepis imparis marches in regular files in going to its aphides. Its nest, excavated in the earth, is well hidden and so deep that I have been unable to reach the bottom of it.

Prenolepis parvula makes little nests everywhere, in wood, in dry leaves or in the earth, and runs about on the turf and in the forests.

Brachymyrmex heeri lives under stones, sometimes in the woods; it is widely distributed.

Dorymyrmex pyramicus is represented in the southern part of North America by two distinct races, *flavus* and *niger*. Both give off a very pronounced odor of Tapinoma (anal glands) and nest exactly like the *pyramicus* of tropical America, hunting in the same fashion. Here at Faisons I found a very curious mixed formicary of these two races. There were two or three nests of them several meters apart. The yellow workers and the black workers entered and passed out peaceably side by side, working together, and presenting every sign of friendship. The two forms were perfectly distinct — no transition form. I destroyed one of their nests to the bottom and was so fortunate as to find there males and females of *niger* and the male of *flavus*, the latter larger and paler. There is scarcely any doubt possible as to the following: This must be one of those rare cases of abnormal, mixed, natural formicaries which I described in my "Fourmis de la Suisse." But this case is certainly not of predatory origin, nor due to the carrying off of pupae as is the case with *Formica*. It was without doubt due to the fortuitous association of two fertile females, one of each of the two species, a state of affairs which I have already admitted possible for certain formicaries of *truncicolo-pratensis* and which is probable also in the association of *Tapinoma-Bothriomyrmex* which I have described (l. c.).

The American species of *Tapinoma* live exactly like those of Europe and possess the same odor.

At Morganton I found a little *Iridomyrmex* related to *humilis*, which runs with astonishing rapidity, following in file, hides its nest in the turf (like *McCooki*) or under a stone, and climbs trees to seek its food. It has a very strong odor of *Tapinoma*.

The American *Ponera coarctata* is very common in decayed trunks and under stones. I have made an observation upon it which is very difficult to make in Europe; but here it is quite constant. When one uncovers a nest of *Ponera* in a rotten tree one sees their yellow cocoons gathered in a corner, quite abandoned by the workers, which do not try to save them or collect them. On the contrary they take the greatest care of the larvae, which they carry off and hide. I suspect that among these ants, less social than others, the pupae escape unaided from their cocoons, without the assistance of the workers.

I found two *Amblyopona* in a rotten trunk and a *Proceratium* under the bark.

Two days ago, in cutting with a chisel into a rotten trunk in a pine wood, what was my surprise to find here at Faisons some *Eciton*. Two blows more showed me that I had had the good luck to fall upon a nest with its thousands of larvae and pupae.

To my great surprise all the pupae were naked, without cocoons, contrary to those which have been described and sent to me by W. Müller with *Eciton burchelli*. This little *Eciton*, of a reddish yellow, is related to *californicum* and without doubt described by Emery. I at once set to work to demolish the nest in order to discover the female, which is yet unknown (with the exception of *Pseudodichthadia incerta* André, of which the worker is unknown).

The trunk was literally impregnated with *Eciton* for a foot above and a foot below the soil. Not a square centimeter of rotten wood was exempt. I demolished everything, down to the ground under the roots, without finding the female. Finally, in looking over the debris, I found it, a long, broad, blind and wingless creature with immensely distended abdomen, moving slowly in the midst of the workers. Its thorax is narrow and somewhat rectangular. The pedicel has only *one* joint, very similar to that of *Labidus!* The characters are thus intermediate between the male and the workers. A leap for joy at this discovery.

About fourteen millimeters long at a guess. Mandibles sublinear, with parallel edges, without teeth, pointed at the end, slightly curved. Maxillary palpi two-jointed. Labrum emarginate. Scape short, strongly thickened in the second half. Segments of the funiculus longer than wide. Head rotundo-quadrate, with a wide longitudinal furrow from epistoma to occiput. Thorax narrow and elongate, especially the pronotum and mesonotum. Pro-mesonotal suture obsolete. Mesonotum oval, subdepressed. No scutellum or intermediate segment. Meso-metanotal suture distinct, concave in front. Metanotum wider than long, depressed, with a wide median impression on the basal face and two strongly rounded protuberances on each side. Basal face longer than the declivent face. Pedicel compressed from each side, wider than long, wider before than behind, with a superior face and two lateral borders. Its posterior edge is widely and deeply emarginate, forming thus on each side a broad obtuse tooth directed backward (form of *Labidus*). A broad, obtuse tooth beneath, in front.

The abdomen alone, both distended and elongate (the entire female is strongly elongate) is about nine mm. long. The pygidium and hypopygium form two wide, elongate disks, the first convex, the second rather flat and passing the first.

Eyes absent. Legs rather long, permitting locomotion. Tibiae and femora scarcely sub-depressed. The whole insect shining, finely punctate, except the thorax and the pedicel which are plentifully and more coarsely punctuated. Pile erect, fine, yellowish, abundant, pointed, generally distributed. Reddish. Legs and antennae a dirty yellow.

I placed a part of the nest in a bag in order to observe these interesting ants, and I have not yet finished studying them. Unfortunately there were in the nest only pupae and larvae of workers. I found a myrmecophile in it. The following observations seem to me important to record: The Ecitons carry their larvae and pupae, which are very elongate, by placing themselves astride over them with their six legs, like *Polyergus* but in a more accentuated fashion. Even the little workers carry the large pupae in this way, touching the ground only with the ends of the tarsi. But by so doing they travel very fast and have the antennae free. In the second place, their instinctive faculty of concerted action and of forming in line quite excels everything I have seen among other ants. Throw a handful of Ecitons with their larvae down upon strange ground. Under similar circumstances, where other ants scatter themselves about in confusion and require an hour or more (sometimes less) to arrive at any kind of order, to gather their pupae and especially to examine their surroundings, the Ecitons cooperate without losing a single instant. In five minutes they have formed distinct files of workers which do not wander from each other, carrying in part the larvae and pupae and traveling in a somewhat direct line, touching the ground with their antennae, exploring all holes and cracks until they find a cavity suited to their needs. Then the removal is executed with an order and celerity which is astonishing. As if by word of command the workers follow and understand each other, and in very little time everything is safe. There is no question of mutual transportation: it is more precisely the system of *Tapinoma.* The fact is remarkable in the case of a blind ant which has only its antennae with which to direct itself.

The American *Aphaenogaster* which I observed are all great hunters and subsist upon the insects which they catch. They are very fond of termites, and when one uncovers and scatters about a nest of termites in a wood, they hasten to feast on these succulent morsels. *A. fulva* is most common. It varies enormously and nests in rotten logs or under stones, especially in the forests, sometimes in rather large formicaries. *A. tennesseensis* makes immense formicaries in rotten trunks. I saw one of them near Niagara. In trunks of trees at Morganton and here, at their foot or under the bark, I found rather large formicaries of a beautiful species (*lamellidens* or *mariae*). Finally *A. treatae,* which abounds in the forests at Morganton, Black Mountain, near Mr. Tyson's, and here, in all parts of North Carolina, excavates little nests in the ground (never in logs), sometimes under stones. These nests open by a large, widely open hole, rarely two. The workers go out singly and are fearless hunters. The formicaries are not numerous. I found but one rather large one at Mr. Tyson's and the workers boldly attacked me when I disturbed it.

The American species of *Myrmica* have the same habits as the corresponding European forms and present nothing of interest. It is the same with *Leptothorax.* One species of the last makes its nest in curled up dead leaves on the ground. I found it by following a worker which bore a pupa. *Dichothorax* nests here at Faisons in small, dry, fallen branches among the dry leaves of the forest and feigns death. A *Myrmica* found at Mr. Tyson's and related to *M. rugulosa* also feigns death on every occasion.

I have just found here two formicaries of *Pogonomyrmex badius Latr.* (= *transversus* Sm. = *crudelis* Sm.). This species makes, in barren fields, a flat, rounded, dome-crater, covered with little stones. It stings in a terrible fashion. Having attacked it imprudently, I received two stings on the hand and suffer from them still, several hours after. Its stings are more severe and painful than those of our *Vespa germanica* of Europe. As has been remarked by Mrs. Mary Treat this species does not cultivate any special plant and makes no clearing around its nest by cutting down the plants. But Mrs. Treat was wrong in concluding from this fact that the same holds true for *P. molefaciens* of Texas. *P. badius* gathers several kinds of seeds; in demolishing its nest I discovered its granaries which are very flat, but well arranged.

On lifting up a stone at Black Mountain I saw a brown ant withdraw itself into a gallery. The magnifier enabled me at once to recognize *Atta* (*Trachymyrmex*) *tardigrada* Buckley! The mushroom garden of this single northern species of the group being still entirely unknown, I set myself in quest of it. The workers issued first in rather large numbers to defend themselves, especially when I placed before them some *Cremastogaster*. Soon I saw come up from the bottom of the nest some workers carrying little gray balls with which they obstructed the opening. I judged that these were from the mushroom garden and proved it by taking one of them in my forceps. Did they seek in this manner to repel the *Cremastogaster* by the odor of the mushroom? Did they wish to prepare for flight? I do not know. Some of them strangled several of the *Cremastogaster* with their mandibles. Finally I decided to open the nest to the bottom. It was not deep. It consisted of a large chamber the size of an egg and was filled with a mushroom garden which enclosed the pupae, several females, etc.

This nest recalled one made by some captive *Atta* (*Acromyrmex*) *octospinosa* in the earth under a saucer. It contained about two hundred workers. I placed a part of the mushroom garden in alcohol and tried in vain to make the mycelium of the rest grow in a damp vial. I shall send it to Prof. Moeller. McCook has claimed that *A. tardigrada* cuts off the needles of pines and firs. There were none of these trees in the vicinity of the nest. As *Trachymyrmex* makes a mushroom garden simpler than the other *Atta* and as their fungus is not Rhozites, I suspect that *tardigrada* employs other material (detritus, larval excrements, etc.) like the other species of the subgenus which I observed in Colombia.

The *Cremastogaster lineolata*, *ashmeadii* etc., of North America live, especially the latter, by preference in rotten trunks or in branches fallen to the ground in the forests. In these they make large formicaries. They are found under stones also, especially *lineolata*. They do not use dry, hard trees like *scutellaris* of Europe, so that their nests are easy to demolish. However, their habits are uninteresting, like those of nearly all *Cremastogasters*.

The species of *Pheidole* are numerous and live under bark or in the earth in excavated nests with small crater-like openings. At Black Mountain a species makes large, almost dome-like nests which are very populous. Here at Faisons I have found several species of them under bark. At Morganton I witnessed the marriage-flights of the males and females which appeared in swarms in the early evening in front of the Asylum.

Monomorium ebeninum is very common and lives here, as in the Antilles, in dry branches, very often in those fallen to the ground in the forests. I witnessed a removal.

Various species of *Solenaspis* live in double nests as in France and elsewhere with various large ants, especially with *Formica exsectoides*, *subsericea*, etc., but very often with termites also, particularly in rotten trunks where they insert themselves between the passages of their victims.

I cannot finish this short notice of the habits of the North American ants that I have observed thus far, without thanking most sincerely my good friends and colleagues Dr. Ad. Meyer of Worcester, Dr. Murphy of Morganton, and Dr. Faisons of Faisons, to whose aid, hospitality and inexhaustible kindness I owe all that I have discovered. Now I go to visit the able American myrmecologist Mr. Pergande at Washington and thence return to Europe.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXIV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Eois inductata Guen. The moth from which these eggs were obtained was in very poor condition and the larvae died before pupation, but I believe that the determination is correct and that there are no more larval stages. There is no previous description of this larva.

Egg. Long and nearly cylindrical, less in one diameter but not with any flattened surface; one end first a little bulging, then tapering to a round blunt point, wedge shaped from side view, the other end (micropylar) roundedly truncate. About eighteen longitudinal ribs, fluted at the joinings of the faint regular cross-striae which form square cells. Ribs diminishing by a few before the ends; micropylar end coarsely irregularly reticulate. Pearly white, looking beaded from the fluted ribs. Length .9, width .4 × .3 mm. The next day turned pink, shading to red at the truncate end.

Stage I. Head rounded, free, slightly bilobed, luteous, faintly mottled with brown; width .3 mm. Body slender, whitish, a rather broad, even, brown-gray dorsal band, separated on joints 2 to 4 into four diffuse lines, but soon merging into a single, broad dorsal band to joint 13; a broad subventral band, the pair separate. Tubercles pale, nearly obsolete; setae short, dusky with small enlarged tips. Feet pale; segments finely, about 20-annulate. Anal flap pale. Segments scarcely enlarged centrally, uniform, smooth. After feeding turned greenish by transparency.

Stage II. Head round, scarcely bilobed, free; whitish, a white stripe on the face of each lobe, containing an isolated brown dot opposite middle of clypeus; many brown dots filling the median suture and apex of clypeus, also on the outer side of the white band; labrum pale; ocelli and tips of antennae brown-black; width .4 mm. Body moderately slender, smooth, normal, segments, numerously (about 20) annulate, but not distinctly; setae short, black, rather coarse. Dorsum broadly dark brown, cut near its edge by a linear, slightly flexuous, pale yellowish subdorsal line, most distinctly at the ends and in incisures; sides pale green; a broad subventral band, colored like the dorsal one and slightly intensified at tubercle vii on each segment. Venter pale green rather narrowly. Cervical shield more reddish than the rest of the dorsum. Feet all pale.

Stage III. Head rounded, not bilobed,

held out flat, free from joint 2; antennae rather large, divergent, straight; white with broad bands of brown mottlings, one on side of lobe and one next the median suture; suture itself brown as also the clypeal suture above; antennae black tipped; width .6 mm. Body moderate, segments about 30-annulate, rather obscurely. Dorsum broadly brown, pulverulent, cut by narrow pale subdorsal line and on joints 2 to 5 by a dorsal line also. Shields concolorous, the anal plate pale at the sides. Subventral fold white, slightly yellowish. A broad subventral purple-brown band, emphasized below the spiracle by a darker patch; a nearly contiguous pale line below this band; venter narrowly white. Feet pale outwardly; setae short, black; tubercles minute.

Stage IV. Head white with brown dotted bands as before; width .9 mm. Body moderate, uniform, finely annulate. Dorsum dark brown, a fine white subdorsal line continuing the white of head; a paler brown lateral band in part contiguous to a still paler suprastigmatal one. Subventral fold white, a trace yellowish. A geminate subventral pale brown band, the upper half containing a nearly black dot below and before the spiracle. Venter not broadly whitish. Feet pale, the abdominal ones faintly brownish marked. No discolorous shields.

Stage V. Head erect, rounded, higher than wide, scarcely bilobed, antennae distinct; whitish with a brown shade, black dottings on each side from ocelli to vertex and between the lobes over the median suture; sutures of clypeus dark; width 1.1 mm. Body slender, the segments moderately drawn out, the central ones about 25-annulate, uniformly, annulet 1 somewhat larger. Whitish, dorsum pulverulently brown shaded, forming a dark geminate dorsal line, diffuse outwardly, followed by a pale subdorsal line, on the abdomen faintly, but on thorax and joint 5 distinctly edged by dark dottings. A whitish band on subventral fold; a vinous brown spot below it a little in front of the spiracle, distinct on joints 5 to 7, faint on 8 and 9. Feet pale or a little brownish dotted, the anal ones elongate triangular. Tubercles minute, dark; setae short, dark, slightly enlarged before tip. Spiracles brown rimmed. There are some secondary setae present, forming about twenty hairs in all on each side of a segment, all alike in size and color. Most of the extra ones are subdorsal in a continuation of the line of i and ii and subventral posterior.

Food plant unknown. The larvae fed on rag weed and clover. Moth from Washington, D. C. Eggs June 1, last larval stage July 1, but all died soon after without pupating.

A NEW USE FOR AN OVIPOSITOR. — A female *Deidamia inscripta* emerged in one of my boxes and in some way injured the first two legs on one side. After two or three days I noticed that when the moth hung from the lace over the top of the box it clung with the remaining legs, and thrust its ovipositor up through a mesh of the lace bending its tip forward so that it held like a bent finger. In this position the moth rested for many hours daily. *Caroline G. Soule.*

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SKETCH OF THE HABITS OF NORTH AMERICAN ANTS — II.

BY AUGUSTE FOREL, CHIGNY PRÉS MORGES, SWITZERLAND.

Translated by A. P. Morse.

Appendix to the preceding letter (unpublished).

After sending this account to your Society I made a visit to Mr. Pergande and compared in part my gatherings with his collection. The *Eciton* is *E. carolinense* Emery.

I forgot to say that the *E. carolinense* had only larvae and worker pupae in the nest. I could find the larvae of neither males nor females, which is much to be regretted.

The conclusion of my journey presented still other interesting facts, which follow:

Arrived at Washington, on the way from Faisons, I was received in most welcome fashion by my estimable colleague Mr. Pergande, entomologist of the Dept. of Agriculture of the U. S. Mr. Pergande aided me in finding numerous species of ants whose dwellings he knew and his beautiful collection afforded an opportunity to make instructive comparisons.

A small *Formica* found near Mr. Tyson's in a very small nest of woody materials, like a miniature of *F. integra* and its nest, is *F. difficilis* Emery. I took its curious yellow female also. It has exactly the appearance of *integra* and *pratensis*.

I discovered also the beginning of a formicary of *Camponotus marginatus* Latr., that is to say the female alone with some cocoons.

Then Mr. Pergande showed me in the earth the nests of a black *Monomorium* different from *ebeninum* (*carbonarium* var.?; *minutum* according to Emery), with the *metanotum* rounded. I have found it since then frequently, nesting in the ground, while *ebeninum* seems to nest regularly in dead wood and hollow stems.

A nest of *Formica obscuriventris* Mayr was constructed like those of *integra*, but I saw no roads.

In hunting under logs along the Potomac we found *Stenamma diecki*, *Strumigenys clypeata*, *Proceratium crassicorne*, and other rarities of secluded habits. Even in the streets of Washington two formicaries of large *Tetramorium caespitosum* L. waged deadly war against each other on the sidewalks, a habit of these ants as McCook and I have already described.

At Cromwell, Ct., where I stopped afterward, I found some colonies of *Formica exsectoides* with more woody materials. I placed a handful of *exsectoides* from a nest in a wood, about five hundred paces from another, toward the latter, in order to discover if they were of the same colony. Some workers seized the newcomers for an instant by the legs. Aside from this, peace and fusion. The experiment is not, however, conclusive, because in Europe we see *F. exsecta* of different colonies behave in nearly the same manner.

By making some *F. exsectoides* fight with other species (*pallidefulva* and *sanguinea*), I was able to ascertain that they have not, like *exsecta* of Europe, the instinct to seize their enemies by the neck, in order to saw it apart. Their analogy with their European congener is, therefore, only partial.

At Cromwell, in the brush of a cleared woodlot, I had the good fortune to be present at the attack on a formicary of huge *F. subsericea* by a feeble band of *F. sanguinea*, smaller and much less numerous. The *sanguinea* were scarcely thirty in number and a third of them were recently enclosed workers, still immature.

Evidently it was a newly started formicary which was thus engaged. The *subsericea* had their nest at the foot of a large mullein (Verbascum). In number they were at least tenfold their aggressors. Each of them was, I can affirm, as well armed and on an average larger than and equally as robust as any of the assailants. Well. the mere arrival of this little troop of *sanguinea* was sufficient to spread a panic in the formicary of *subsericea* which fled with their larvae and pupae without attempting any serious defense, allowing the *sanguinea* to seize their young and take possession of their nest. Only one or two small *sanguinea* were killed. The instance is noteworthy because in this case neither the formidable weapons, the violence, nor the impetuosity of the little band of *Polyergus rufescens* whose similar aggressions I have described in my "Fourmis de la Suisse" can be alleged. The bold and courageous tactics of the *sanguinea* were even somewhat less marked than among those of Europe, which fight with species smaller and weaker than themselves. I have never seen a cowardice so absurd or so complete as that of these American *subsericea*, and this cowardice indicates very clearly the instinctive adaptation of the slave-making species to attack and of the enslaved species to flee.

At Hartford, Ct., I discovered a small mixed formicary of *Formica exsectoides* and *F. subsericea*. There was scarcely any doubt of the common and intimate life of the two species in the same nest. They went in and out at the same doors, etc. Here the artificial experiments of a myrmecologist were excluded. This case is undoubtedly the same as that described for the first time in my "Fourmis de la Suisse," that is to say, an abnormal, mixed, natural formicary resulting from a battle between the two species, a battle in which *exsectoides* had the best of it and had raised the pupae taken from *subsericea*. Here, as in Switzerland, the mixed formicary was not populous, much less so than those of *exsectoides* usually are. The nest was small. I believe it necessary to be cautious and to ask if the apparent association of different species of *Formica* is not also due at times to the association of fertile females of the two species. The fact could, on occasion, be verified. At Hartford time did not permit me to do this.

In the suburbs of Boston (Franklin Park) I found among others a *Strumigenys*, some *Brachymyrmex heeri*, a *Cremastogaster*, and a solitary worker of *Polyergus lucidus*, a fact which is astonishing if one considers that the latitude of Boston is nearly 45° N. [more nearly 42° 20′] (nearly the same as Turin), and that it is much colder than in the same latitude in Europe. Now these genera of ants love heat.

In the old world the number of species is less in continental than in maritime climates. Thus the ant-fauna of Bulgaria is much scantier than that of the south of France. Besides, the fauna there is upon the whole less southern. But it is necessary to take into account other factors without which one cannot understand why the fauna of North America, in spite of the continental climate of the country, is so much richer than ours.

However, one finds, even with us, some exceptions. Thus *Myrmecocystus viaticus*, a southern form, extends farther north in eastern Europe (continental climate) than in western Europe (maritime climate). This species, therefore, stands a rigorous winter well provided it has a hot and dry summer, while with others it is for the most part the contrary. But it is evident that for America there are some facts of prehistoric geological geography which have contributed to preserve there a fauna and flora very much richer than in the Old World. This fact is well known and of great interest, considering the close relationship between the nearctic (North American) fauna and flora on the one side and the palearctic (northern Old World) fauna and flora on the other, a relationship which is antecedent to the glacial epoch, when the two faunae were connected by Greenland. Moreover, one observes some facts in America analogous to those of the Old World. Thus North Carolina has in its western part a distinctly continental climate, while in the east the Gulf Stream gives it one of somewhat maritime character. Now, the ant-fauna of the state is much richer in the east than in the west. It is true that the western part is also somewhat more elevated; but the mild winter is without doubt the principal cause of this wealth.

STUDIES FOR STUDENTS.—II.

THE HISTOBLASTS (IMAGINAL BUDS) OF THE WINGS AND LEGS OF THE GIANT CRANE-FLY (*Holorusia rubiginosa*).

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIF.

Technical note.— In an old larva of *Holorusia* (or other Tipulid) killed as described in Studies for Students,— I, (PSYCHE, 1901, p. 207,) make a longitudinal cut through the dorsal body wall from head to posterior tip of body and pin out in dissecting dish with ventral aspect down. Remove the fat body and alimentary canal with salivary glands, exposing completely the longitudinal and annular muscle fibers of the body wall. In the thoracic segments carefully pick away these muscle fibers, thus exposing six small white bodies lying, one pair in each thoracic segment, in immediate contact with the skin. These are the histoblasts (imaginal buds) of the wings and legs of the imago.

Position, and External Characters.

The *histoblasts*, imaginal buds or imaginal discs, as they are variously termed, of the wings and legs of the imago of *Holorusia* are readily found in the old larvae. They are small, firm, white bud-like bodies * (fig. 1, A) lying in the thoracic segments, against the *hypoderm* (cellular skin layer of the body wall) of which they are actual invaginations. There are two pairs in each segment, those of the prothorax being the beginnings of the fore legs and of the pupal dorsal prothoracic respiratory tubes, those of the mesothorax corresponding to the mesothoracic legs and wings, and those of the metathorax to the metathoracic legs and halteres. In the dissection as made, the inner or mesal buds are those of the legs, the outer or lateral ones being those of the respiratory tubes, wings and halteres. The buds of the respiratory tubes and of the balancers are smaller than the others.

By examination under the microscope it may be seen that each bud is connected intimately with the hypoderm by a very short *neck*. The buds may be swayed slightly to one side or the other. If care is taken in dissecting away the viscera and muscles to expose the buds, each will be noted to have a *tracheal tube* running to it.

Histology and Development.

For a study of the structure and of the development of the histoblasts it is necessary to make sections (by micro-

* For the reason that some of these "imaginal" buds are in many insects the beginnings of strictly pupal organs which are not present in the imago, I believe that the name imaginal buds or discs should be discarded. The name, histoblasts, used first, I believe, by Künckel d'Herculais, seems preferable.

tome) of them. For this purpose the skin of the thorax with attached buds should be cut out, either in one piece with all the buds, or in segmental pieces with the buds of one segment, or in six distinct pieces, each bud with a bit of skin by itself. These pieces must be properly hardened, cleared, infiltrated with and imbedded in paraffine, sectioned (cut into thin slices) by means of a microtome, and the sections fastened to a glass slide in regular order, stained, cleared, and finally mounted in Canada balsam. For an account of the details of histological technic with special reference to insects, see Comstock and Kellogg's Elements of Insect Anatomy, 1899, pp. 111–129.

In any thoracic bud of *Holorusia* which is about midway in its development a longitudinal section (fig. 2, B) i. e., one through skin and bud at right angles to the long axis of the larva, it may be seen that the bud is composed of an invaginated part of the hypoderm layer which has become folded, and in which there has been a special increase and growth of cells. The folding and modification of this part of the hypodermal cell layer is such that part of it, called the *peripodal membrane*, is very thin (compared with the rest of it) and serves as a partially enveloping membrane, and as the walls of a neck which connects the thickened part of the histoblast with the hypoderm at the point of invagination. It is the thickened part of the invaginated hypoderm (the inner part of the bud) which is to develop into the wing, or leg, or balancer,

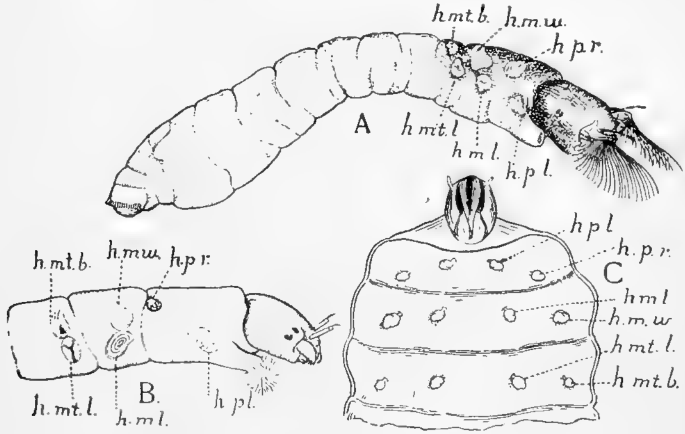

Fig. 1. A, Larva of *Simulium*, showing thoracic histoblasts, as they show through the skin; B, Larva of *Chironomus*, similarly showing thoracic histoblasts; C, Head and body wall of thoracic segments of larva of *Holorusia rubiginosa*, showing histoblasts; *h. p. r.* histoblast of prothoracic respiratory tubes of pupa; h. p. l. histoblast of prothoracic leg, h. m. w. histoblast of wing, h. m. l. histoblastmesothoracic leg, h. mt. b. histoblast of balancer, h. mt. l. histoblast metathoracic leg.

or respiratory tube (depending on which bud is being examined). Outside of the bud, i. e., in the body cavity of the larva, and lying in contact with the bud, may be seen the cut end of a tracheal tube, and, adjoining it, a group of cells containing, or rather changing into, a

The histoblasts will be found in different stages of development in larvae of varying ages. For a careful study of the course of development of the histoblasts it will be necessary to obtain a series of larvae from young to fully grown stages, and to section a series of

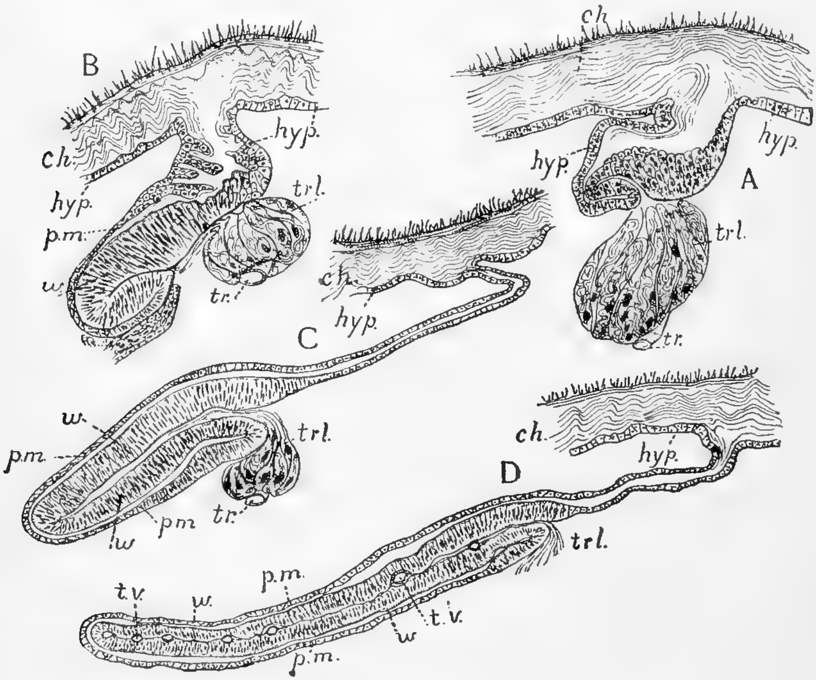

Fig. 2. Histoblast of wing of *Holorusia rubiginosa*, at different stages of development, (in section); A, youngest (of the four stages) B, C, D, successively older stages; *ch*, chitin layer of dorsal thoracic body wall, *hyp*, hypoderm, *p. m.* peripodal membrane, *w*, actual wing-forming part of the histoblast, *tr*, trachea, *trl*, tracheoles, *t. v*, "tracheal vein," (each wing-vein consisting first of a tracheal tube).

mass of fine capillary tubes convoluted and closely massed, called *tracheoles*. Also, there may be noted, perhaps, a few cells called *embryonic cells* which have come from the interior of the body to take part, probably, in the formation of the imaginal wing or leg.

histoblasts taken from these larvae. This development in *Holorusia* is easy to follow, as the larvae may be obtained young and reared in the laboratory, specimens being killed at regular intervals. The size of the buds and the readiness with which they may be dissected out, and sectioned (in any plane desired) makes a detailed study of the development of the wings and legs of *Holorusia* (or any other large Tipulid), a matter readily accomplished by any student who has access to a microtome. The limits of this paper preclude any detailed account of the development. For the orientation of students I figure and briefly describe four stages (fig. 2) in the development of a wing bud, namely, a beginning stage, a middle stage, a later stage, and a stage from a larva nearly ready to pupate. These four stages show all of the parts and the most marked developmental changes of the buds. They should be sufficient to enable a student to interpret correctly the parts and developmental phenomena in a detailed study of the histology and development of the wing-buds of any insect with complete metamorphosis.

In the first stage (fig. 2, A) figured the hypoderm is thickened and invaginated and slightly folded. This folding it will be noted results in a shallow evagination within the cup or cavity formed by the primary invagination. It will be noted that the thickened (bud) layer is perfectly continuous with the normal hypoderm (true skin) which overlies the body just inside of the chitinous cuticle. The neck of the bud is broad and is filled by chitin. The hypoderm layer composing the neck is not thickened, or but slightly. This distinction of thickening is later more emphasized, the thin part being the peripodal membrane, while the thickened part forms the true wing-forming part of the bud. Just outside of the bud in the body cavity and in immediate proximity to it is a tracheal tube (cut transversely across in the section) and giving off a mass of fine tangled *tracheoles* which tend to push into the concavity at the base of the bud caused by the slight evagination of the basal part of the bud. These tracheoles are formed by a peculiar enlargement and tubule-forming of the cells of the epithelium of the tracheal tube. The nuclei of these cells are large and conspicuous. The tracheoles are simply fine capillary tubules, and lack the spiral thread characteristic of tracheae.

In the next stage (fig. 2, B) figured the folding is more pronounced, resulting in a filling up of the cavity caused by invagination, the neck of the bud is narrower, and the distinction between the peripodal membrane and the true wing forming part of the bud layer more pronounced. The chitin inside the bud (which is of course perfectly continuous with the actual outside of the body) can be traced far down in the bud forming a thin double layer indicating always the true external surface of the developing wing.

The third stage (fig. 2, C) shows the two distinct layers of the wing enclosed by the peripodal membrane, and the long slender "neck" of the bud connecting it with the normal skin hypoderm.

The fourth stage (fig. 2, D) shows the two wing layers in contact and the forming veins (in cross section) along this line of contact. The wing now lies as a well formed wing pad with thick cellular layers and forming veins within the cup or cavity formed by the peripodal membrane. To assume its normal definitive position in the imago it is only necessary that it be thrust out through the narrow opening, the mouth of the original invagination of the skin hypoderm. This evagination or shifting from apparently inside the body to outside occurs at the time of pupation, the wing thereafter lying folded on the ventral thoracic aspect of the pupa.

References.

Students undertaking the study of the development of the histoblasts will need to refer to detailed accounts of such development as studied and described by reputable entomologists (and zoologists). For an introduction to, or general abstract of our knowledge of this subject (up to 1897) see "The Imaginal Discs of Insects," by H. S. Pratt, PSYCHE, Feb. 1897, vol. 8, no. 250; for a detailed account of the development of the wing discs of a particular insect species see "The Development of the Wings in the Lepidoptera" by W. F. Mercer, Jour. N. Y. Ent. Soc., March 1900, vol. 8, no. 1. For further references see the bibliography given in these two papers.

Histoblasts Showing Externally.

The integument of the larva of *Holorusia* is too opaque to permit the buds to be visible from the outside of the body, and this is the case with most larvae. But in some the thoracic buds may be readily seen from the outside, and the gross details of their development followed by simple examination of the exterior of the larvae. This is true for example of the larvae of *Chironomus* (fig. 1, B) and especially of *Simulium* (fig. 1, A). The position and gross appearance of the thoracic buds in *Simulium* can be seen in young larvae and the growth and the foldings and convolutions of the hypodermal layer followed by examination of successively older larvae. As the larvae of both *Simulium* and *Chironomus* are common all over the country, (*Chironomus* in ponds and still pools of streams, and *Simulium* in clear swift water in dense patches on submerged rocks) some acquaintance at least with imaginal buds can be made without either dissection or sectioning.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Cingilia catenaria Cram. The mature larva has been described by Harris, Packard, Coquillett and Scudder.

Eggs. Laid loosely and falling to the ground. Elliptical, gently flattened on two sides, one end distinctly and sharply truncate, making the egg not much longer than wide; the other end slightly depressed, rounded; truncate end slightly concave. Smooth, uniformly and rather finely reticulate, the reticulations irregularly hexagonal, slightly raised, subgranular, the areas flat. Truncate end only faintly reticulate, the margin a smooth rim, a dark spot at the micropyle. Pale yellowish green, soon turning sordid lilac and darkening still further before hatching. Size 1.8×.7×.5 mm. The eggs lie on the ground over winter.

Stage I. Head rounded, not bilobed, smooth, wider than high, clypeus moderate; blackish, paler and brownish on the face; width about .3 mm. Body normal, cylindrical, segments submoniliform; rather short, feet normal. Joint 2 whitish, the rest with broad dorsal, narrower but still broad subdorsal and very broad ventral dark brown bands. Tubercles elevated; setae short, dark, with slightly enlarged tips. Segments obscurely, rather numerously annulate. Shields, plates and tubercles blackish. The larva pales with growth, the dorsal band becomes paler than the subdorsal one and grayish, all faintly green tinted. The dark transverse cervical shield looks detached in the white area of joint 2.

Stage II. Head about .6 mm., erect, rounded, moderately bilobed, the lobes full; clypeus rather high; pale yellow, shining, a gray patch at the vertex of each lobe; mouth brown, the large ocelli black. Body normal, moderate; tubercles elevated, rather large but concolorous; setae short, dark. Shields all membranous, concolorous. A narrow black subdorsal line, absent on the shields; two quadrate lateral black patches per segment, obscurely joined by obsolete brownish lateral and stigmatal lines; a narrow brown subventral line, bimaculate with blackish segmentarily. Obscure geminate, submaculate, brownish ventral line. Feet dusky shaded.

Stage III. Head rounded, pale yellow with circular black spots on the epicranial setae, over eyes, a line on back of occiput and patches at apex of paraclypeus, clypeus and epistoma; antennae short, labrum moderate; width 1 mm. Body pale yellow, cervical shield and anal plate with four black spots; leg shield and sides of joint 2 also spotted. Subdorsal line fine, black, not cutting the shields; lateral and stigmatal lines brown, broken at the spiracles, joined by bisegmental black patches; traces of a line just below subventral fold; subventral line black submaculate; adventral line double, brownish. Spiracles black in whitish areas. Segments annulate, not shining.

Stage IV. Head slightly bilobed, the lobes full laterally, clypeus large, not high, triangular, the sutures not deep but distinct, paraclypeal sutures faint; light yellow with four round black spots outwardly on each lobe, a spot over ocelli and some smaller brownish ones on clypeus; labrum white; width 1.7 mm. Thoracic feet close together, abdominal ones on joints 12 and 13. Body light yellow, segments about 12-annulate, but somewhat irregularly; very narrow deep brown longitudinal lines, the subdorsal distinct, lateral suprastigmatal and stigmatal faint, the two latter connected before and behind each spiracle by a conspicuous black patch; spiracle surrounded by a white patch subventral line just below the subventral ridge faint; a-pedal line submaculate in black; two ventral lines on each side, rather distinct. Abdominal feet with brown black spots similar to those on the head. Thoracic feet less distinctly marked with brown.

Stage V. As in the penultimate stage; width of head 2.4 mm. See description of this stage by Scudder (PSYCHE, VI, 124, 1891).

Cocoon an open net of yellow silk spun among leaves.

Pupa as described by Scudder.

Larvae from Woods Holl, Mass., and Bellport, N. Y. Eggs were sent me from Nonquitt, Mass., by Miss C. G. Soule. The eggs are laid in September and hatch the following spring. Larval stages passed slowly.

Food plant, Bayberry (*Myrica cerfiera*).

WILLEM ON APTERYGOTA.

The recent memoir, *Recherches sur les Collemboles et les Thysanoures* (Brussels, 1900) by Victor Willem, is a work of exceptional importance. It gives an abundantly illustrated account of the anatomy of the principal genera of Collembola, supplemented by valuable morphological and phylogenetic discussions upon Apterygota.

The author sustains the view that the ectognathous forms are the more primitive. Willem agrees with Fernald that the ventral tube is supplied with an adhesive fluid by a pair of cephalic glands and defends this interpretation. The lateral eyes of most Collembola are shown to be, not ocelli, but encone constituents of aggregate eyes; in certain Poduridae, however, the eyes are simple ocelli. Grenacher's theory of the ocellar derivation of compound eyes receives strong support. The postantennal organs are perhaps olfactory in function. Abdominal appendages of Thysanura are regarded as modified limbs. The fat body is hypodermal and doubtless excretory among Collembola. Willem gives critical observations upon ovogenesis and spermatogenesis.

In style, the memoir is refreshingly concise and clear,—so consistently concise, in fact, that the criticisms upon other works are often more abrupt than elegant. Although the seventeen plates are left to tell their own story as far as possible, the work is a mine of new information and is indispensable to future students of the Apterygota.

The Royal Academy of Belgium awarded Willem six hundred francs for this deserving memoir.

THE INNER COCOON OF ATTACINE MOTHS.

BY CAROLINE G. SOULE.

Promethea, *angulifera*, *gloveri*, *ceanothi*, and *cecropia* spin the mouth of the inner cocoon in the same way. On pulling off the outer cocoon the inner one is found to be an oval bag, firm and tough, with one end "gathered," like any bag shut by pulling a draw-string, but in the cocoon there is no drawstring. The gathers, or puckers, are not quite regular, but they bring the edge of the cocoon to a central point, closing it as much as is necessary to protect the pupa. When the moth is ready to emerge it has only to push through this end of the cocoon when the "gathers" spread out and exit is easy without any dissolving fluid or cocoon-cutters.

How the caterpillar gathers the end of the cocoon I have not been able to discover, nor can I see what holds the gathers in place at the same time allowing them to spread out when necessary. Of course the pressure of the moth spreads them, but how were they made to draw together, and what trick of spinning held them together without making them immovable?

However done it is a beautiful bit of work, and gives the Attacinae the easiest possible exit from their cocoons.

Subscribers to Psyche in arrears will confer a favor by prompt payment of bills.

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PSYCHE.

MATING OF ATTACUS GLOVERI.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

A. gloveri seems to be as polygamous as *cecropia*, and to mate readily outside its own species. One male mated a female *promethea* twice on successive afternoons; then mated another *promethea* which had previously mated one of its own species; then, two days later, mated a third *promethea*.

Another male mated a female *angulifera* at about 7 p. m.; next day at two p. m. it mated a *promethea*; next day it mated another *promethea* which had mated another *gloveri* the day before; next day the *gloveri* mated a fresh female *gloveri*; and next day it mated the *angulifera* female a second time, the *angulifera* having laid a few eggs meantime.

Another male *gloveri* mated a *gloveri* female twice, then a *promethea*, then another *gloveri* both the latter having been mated to other *gloveri* males first.

In captivity *gloveri* seems ready to mate at any hour, and is active at intervals all day and night, growing much excited by the presence of a female, and being far more active than any Attacine moth I have watched except *promethea* male.

The female *gloveri* in my cages moved about much more actively, before mating, than any Saturniids I have seen, even than *S. cynthia*.

The female *prometheas* mated by *gloveri* males did not oviposit after the first coition, but after the second mating, — with either *gloveri* or *promethea*, —they began to lay eggs almost at once.

An *angulifera*, mated once with *gloveri*, laid a few eggs, and after mating a second *gloveri*, oviposited normally.

Both *promethea* and *angulifera* females, after the first mating with *gloveri*, protruded their ovipositors fully, just as newly emerged moths do, and eagerly mated a second and third time, in two cases five times. I have never before seen the female protrude the ovipositor after mating except for egg-laying. One female *gloveri*, after a long coition and a little egg-laying, hung for hours with the ovipositor protruded to its full length, and mated at once a male put into the cage, though the male was much battered and had mated three or four times before.

Gloveri has oviposited at any time after 2 p. m., and been ready to mate at any time of day or night. In most cases coition has lasted several hours, the longest being over seventeen hours, and the shortest five hours.

In emerging from the cocoon two *gloveri* moths moistened the opened end of the cocoon half an hour or more before emerging. Litmus paper applied to the moist end of the cocoon turned red at once. The other *gloveri*, and by far the greater number, merely pushed through the gathered end of the cocoon, without applying any fluid.

MIOGRYLLUS AND ITS SPECIES IN THE UNITED STATES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Miogryllus, an American genus, has not hitherto been recognized as occurring in the United States, excepting that one of its species, originally described by me as a Gryllodes, was placed here by Saussure, who had not seen it. A study of the material in my collection, though scanty, reveals the presence of no less than five species, all found along our southern border, which may be separated by the table given below.

I have seen none of the species found further south beyond our borders, but as developed in the United States, Miogryllus — first described as a section or subgenus of Gryllus — is distinguished from Gryllus by the much smaller size of its representatives, approximating Nemobius, in the (usual) absence or extremely inconspicuous nature of the auditory foramen on the inner side of the fore tibiae (found distinctly in only one species), in the unbranched or only one-branched (rarely two-branched) mediastinal vein of the tegmina, in the presence of only two "oblique veins" on the tympanum of the male tegmina, in the longitudinal course of the veins on the dorsal field of the female tegmina, in the brevity of the hind tibiae, which are only about two thirds as long as the hind femora and are armed on either side with four or five spines only, and in the striped or banded, usually longitudinally striped, summit of the head. The male tegmina are apically truncate or subtruncate, and the antennae are apparently longer and slenderer than in Gryllus.

Table of the United States species of Miogryllus.

a^1. Auditory foramen on inner side of fore tibiae absent or very obscure.

b^1. Disk of pronotum mottled irregularly with dark and light in equal masses, or wholly dark; hind tibiae not or scarcely more than two thirds as long as hind femora; mediastinal vein of tegmina not more than one-branched.

c^1. Head relatively large; pronotum noticeably broader in front than behind, the colors on disk and lateral lobes prevailingly light . . . *capitatus.*

c^2. Head relatively small; pronotum not or but feebly broader in front than behind, the colors on disk and lateral lobes prevailingly dark.

d^1. Head conspicuously striped longitudinally; lateral lobes of pronotum narrowly margined beneath with light color; tegmina shorter than head and pronotum combined, the mediastinal vein unbranched . . *lineatus.*

d^2. Head generally black, sometimes slightly striped longitudinally; lateral lobes of pronotum broadly margined beneath with pale color; tegmina longer than head and pronotum together, the mediastinal vein one-branched *saussurei.*

b^2. Disk of pronotum mainly light, with transverse dark stripes; hind tibiae distinctly, though but slightly, more than two thirds as long as hind femora; mediastinal vein of tegmina one- or two-branched . . . . *transversalis.*

a^2. Auditory foramen on inner side of fore tibiae distinct though small . *sicarius.*

Miogryllus capitatus sp. nov.

A stout species, conspicuously marked. Head large, tumid, glistening, dark fuscous above, conspicuously striped longitudinally with testaceous, there being three stripes on either side, while all the lower part of the head is testaceous, including the mouth parts; eyes black; antennae luteo-testaceous. Pronotum half as broad again as long, increasing slightly but distinctly and regularly in size from behind forwards, both margins truncate, with a median impressed line, the disk and upper half of lateral lobes mottled with blotches of fuscous and ferrugineo-testaceous in about equal amounts, the lower half or more of the lateral lobes testaceous but narrowly edged with fuscous. Tegmina about as long as the head and pronotum together, apically subtruncate, testaceous, the mediastinal vein one-branched. Legs testaceous, the fore tibiae with the auditory foramen of inner side very feebly indicated, the hind tibiae slightly more than two thirds as long as hind femora, with five spines on either margin above.

Length of body, 12.5 mm.; pronotum, 3 mm.; breadth of head, 4.75 mm.; of pronotum in front, 4.5 mm.; length of tegmina, 5.75 mm.; hind femora, 9.5 mm.; hind tibiae, 6.5 mm.

1 ♂, 2 immature. Gulf coast of Texas (Aaron).

The large head is the noticeable feature in this species.

Miogryllus lineatus.

Gryllodes lineatus Scudd., Ann. rep. chief eng., 1876, 499 (1876).

The hind femora are 6.5 mm. long and the hind tibiae 4.25 mm.

Between Virgin River and Ft. Mohave, Ariz., Aug. (W. Somes).

Miogryllus saussurei.

Gryllus saussurei Scudd., Proc. Bost. soc. nat. hist., xix, 35–36 (1877).

The measurements of the hind legs are: femora, ♂, 9.5 mm., ♀, 9 mm.; tibiae, ♂, ♀, 6 mm.

Georgia (Morrison); Rosewell, Geo. (King); Sandford, Fla. (G. B. Frazer); Key West, Fla. (Morrison).

Miogryllus transversalis sp. nov.

A relatively slender species, testaceous, transversely marked with fuscous. Head rather small, testaceous, marked with a large fuscous patch between the ocelli and for an equal space behind them, as well as down the front nearly to the clypeus on either side next the antennal scrobes; eyes and a patch below them fuscous; antennae three or four times as long as body, ferrugineo-testaceous, the basal joint luteous. Pronotum about half as broad again as long, subequal but broadest in the middle, both margins truncate, the disk luteo-testaceous, broadly margined behind with fuscous, the lateral lobes shallow, fuscous, with an oblique elliptical luteous patch at the lower anterior angle. Tegmina considerably longer than head and pronotum together, apically truncate, testaceous more or less infumated, the veins luteous, the mediastinal vein one- or two-branched; wings apparently aborted. Legs pale luteous, slightly flecked with fuscous, the auditory tympanum on inner side of fore tibiae wanting, the hind tibiae somewhat more than two .hirds as long as the hind femora, with five rather long and slender spines on either margin above.

Length of body, 13 mm.; pronotum, 2.5 mm.; breadth of head, 3.75 mm.; of pronotum at front margin, 3.5 mm.; length of tegmina, 5.6 mm.; of hind femora, 10 mm.; hind tibiae, 7 mm.

1 ♂, Biscayne Bay, Fla. (Mrs. A. T. Slosson).

This species is remarkable for the transverse effect of the markings of the front of the body and has relatively longer hind tibiae than the other species.

Miogryllus sicarius sp. nov.

A light-colored slender species. Head testaceous with a large vertical fuscous patch extending from the hinder edge of the antennae backward, but not reaching the eyes, and containing two slender longitudinal testaceous stripes. Pronotum about half as broad again as long, equal in breadth throughout, the hind margin feebly sinuous, the whole testaceous considerably blotched with transverse patches of fuscous on the disk, the lateral carinae marked posteriorly with fuscous, the lower margin of the lateral lobes and the hind margin of the disk feebly edged with fuscous. Tegmina testaceous, fully as long as head and pronotum together, not apically truncate, the mediastinal vein unbranched; wings exceedingly long, extending backward when at rest about as far as the outstretched hind legs. Legs testaceous, the auditory foramen on inner side of the fore tibiae small but distinct, short oval; hind tibiae about two thirds as long as hind femora, with four spines on the inner, five on outer row; ovipositor twice as long as hind tibiae.

Length of body, 13 mm.; pronotum, 2.25 mm.; breadth of head, 3.5 mm.; pronotum, 3.5 mm.; length of tegmina, 6 mm.; hind femora, 7.75 mm.; hind tibiae, 5 mm.; ovipositor, 10 mm.

1 ♀, San Diego (Uhler).

This is the only species which has a distinct auditory foramen on the fore tibiae.

KERMES QUERCUS LINN.

BY GEO. B. KING, LAWRENCE, MASS.

Just recently Dr. L. Reh, of Hamburg, Germany, sent me some scale insects for names. In one vial, to my surprise and with much pleasure, I found a scale insect which seems to have been involved in obscurity for over a century and is here technically described for the first time.

Kermes quercus L. 1758.

Coccus quercus L. 1758.
Chermes quercus reniformis Geoff. 1762.
Coccus quercus roboris L.

♀ scale shiny, subglobular in shape, emarginated posteriorly, which makes the scale in some individuals appear kidney shaped, variable in size, 3½ mm. long 3 wide, 3 high, some much smaller. Color red-brown, with transverse broken black bands.

Young ♀ larvae gray-brown, elongate oval very small. Spread under a cover-glass 520 micromillimeters long and 260 broad. The skin is clear, with a yellowish tinge, quite thickly beset with indistinct short sharp spines 8 µ long, and four longitudinal rows of *glandiform* spines, practically the same as those found in *Pseudolecanium californicum* Parrott. Between and in front of the antennae are two ordinary spines 16 µ long. Caudal tubercles small, each with one long bristle 180 µ long, one spine-like hair 40 µ long, one short spine 16 µ long and one glandiform spine. A little distance above the anal orifice are two ordinary spines 16 µ long.

Antennae 6-jointed, measuring in µ as follows:

Joint	1	2	3	4	5	6	
	20	20	20	12	20	28	Formula 6(1235)4
	24	20	20	12	16	28	" 61(23)54.

All the joints have short thin hairs.

Middle legs short, stout. Coxa, 20. Femur with trochanter, 80. Tibia, 36. Tarsus, 40. Claw 20 µ long.

The above described examples were found by Dr. L. Reh on *Quercus* sp. at Borstel near Hamburg, Sept. 18, 1899. Its nearest North American ally is *Kermes pubescens* Bogue and belongs in *galliformis* section.

Bibliographical notes. — Linné, Syst. Nat. vol. 2, 1806, p. 712. No description is given, but cites Reaum. Ins. 4, tab. 6, fig. 1–4, and gives the food plant as *Quercus robus.*

Geoffroy Histoire abregée des Insectes, vol. 1, 1762, p. 508 says *Chermes quercus reniformis.* Reaumur, Ins. 4, tab. 6, fig. 1. Le *Kermes reniforme* du Chêne (the *reniform Kermes* of the oak). Its form differs from that of all the others, it approaches the figure of a kidney. As to its color it is brown.

Fabricius, Systema Entomologiae, 1775, p. 743, says *Coccus quercus roboris* Linn. Syst. Nat., vol. 2, p. 740–5. Faun. suec. 1016, *Chermes quercus reniformis.* Geoff. Ins. vol. 1, p. 508–13. Reaum. Ins. 4, tab. 6, fig. 1–4. Habitat in *quercus robore.*

Dr. George Dimmock has a copy of Reaumur's work which belonged to Jacques Brez, who was a preacher in Widdelverg, Holland (born 1771, died 1798) author of La flore des insectophiles," which gives a list of insects according to the food plants they attack." In this Reaumur he had written names against all the species he could recognize, and he marked on plate 6, fig. 1–4. *Coccus quercus* Fabr. [= *Chermes quercus* L.] Dr. Dimmock tells me that Mr. Brez wrote in French and began publishing on insects at the age of 19, and died at 27. Signoret in Essai sur les Cochenilles gives the food plant as *Quercus pedunculata.*

In Proc. acad. nat. sci. Phil., 1899, p. 270, by Prof. Cockerell are some notes on *Kermes.*

A CHECK-LIST OF THE MASSACHUSETTS FORMICIDAE, WITH SOME NOTES ON THE SPECIES.

BY GEO B. KING, LAWRENCE, MASS.

Among the many branches of Entomology, I know of none more interesting, so full of wonder and amazement, as the study of the ants, whose habits and customs indeed in many instances approach those of man. Why there are not more observers making a special study of these interesting creatures, it is hard to comprehend. It is hoped, however, that the time is not far distant, when some men of means will see fit to leave at least a portion of their great wealth to be used for special research in the collecting and the study of our ants. I have read with much interest, the two recent articles in this journal, translated by Mr. A. P. Morse, of the results of Dr. Auguste Forel's brief study of our American ants. He indeed observed many interesting things for so short a visit. His finding of the beginning of a formicary of *Camponotus marginatus*, that is, the female with some cocoons is interesting. This I have observed frequently with *Camponotus pictus* and *C. ligniperdus*. At Andover, Mass., sometimes alone, again with young larvae, and occasionally the female with from one to five small workers. The mounds of *Formica obscuripes* I have found several times. They cannot be called rare of *F. subsericea*, these are very seldom met with; four I think is all observed by me. Only on one occasion have I seen a mound inhabited by *Lasius flavus*. This was in Methuen, Mass., in a meadow where there were two good sized mounds all covered with growing grass. The openings were on the top of each nest.

Now just a passing notice on the records of the occurrence of ants in Massachusetts. Mr. E. A. Schwarz in his account of the Myrmecophilous Coleoptera found in temperate North America (Proc. ent. soc. Wash. vol. 1, 1890) cites eight species of ants which proved to be myrmecophilous species, found by Mr. Blanchard at Lowell, Dracut, and Tyngsborough, Mass., viz.: *Formica exsectoides*, *F. schaufussii*, *F. fusca*, *Lasius niger*, *Camponotus pictus*, *C. pennsylvanicus*, *Aphaenogaster fulva* and *Tapioma sessile*. Dr. Hamilton in his Catalogue (Can. Ent. vol. 20, 1888) refers to Mr. Blanchard's findings, but gives no names of the ants. Dr. Packard in his guide to the study of insects 1869, cites *Myrmica molesta*, (*Solenopsis molesta* Say,) *Formica sanguinea*, var. *rubicunda*, Em, *F. pennsylvanicus*, *Camponotus* sp., and *C. herculanea*. Dalla Torre's catalogue, 1893, only cites one species from Mass., *Stigmatomma pallipes*, Hald. In 1896 there were 261 recorded species from North America. Of this number we now know 55 to be found in Mass. All of these have been found by me, with but three exceptions: *Strumigenys* sp. found by Dr. Forel and *Monomorium pharaonis* and *Tetramorium caespitum*, found by Dr. Dimmock. It does not appear, and it should not be understood from anything which appears in the above, that we know all the species of ants in Massachusetts; far from it, for as a matter of fact only one city and a part of four small country towns have as yet been looked over to any extent. So if we ever do know, some one must spend at least twenty-five years (in Massachusetts alone) and after he has got through another observer can begin where the work was left off and will find all that he wishes to do, as there will always be new problems presenting themselves for him to solve; for it is not only the ants' habits and the number of species which are to be considered, but the thousands of other insects which are to be found associated with them. The following are all the species thus far found to inhabit Mass.

Tritis *Camponotidae.*

Camponotus baeviatus Sm.
" castaneus Latr.
" " subsp. americanus Mayr.
Camponotus herculeanus L.
" " subsp. ligniperdus Latr.
Camponotus herculeanus var. pictus Forel.
" " subsp. pennsylvanica Deg.
Camponotus marginatus var. nearcticus Em.
Camponotus marginatus var. minutus Em.
Polyergus rufescens Latr., subsp. lucidus Mayr.
Formica sanguinea Latr., subsp. rubicunda Em.
Formica rufa L. obscuripes Forel.
" " subsp. integra Nyl.
" exsectoides Forel.
" pallide-fulva Latr.
" " " subsp. schaufussii Mayr.
Formica pallide-fulva subsp. nitidiventris Em.
Formica pallide-fulva subsp. fuscata Em.
" fusca L.
" " var. subsericea Say.
" " var. subaenescens Em.
" " var. neoclara Em.
" " subsp. subpolita Mayr.
" lasioides Em.
" " var. picea Em.
Lasius niger L.
" " var. americanus Em.
" " " neoniger Em.
" brevicornis Em.
" flavus L., subsp. myopes Forel.
" umbratus Nyl., subsp. mixtus Nyl.
" " subsp. aphidicola Walsh.
" claviger Rog.
Prenolepis imparis Say.
" parvula Mayr.
Brachymyrmex heeri For., subsp. depilis Em.

Tribe *Dolichoderidae.*

Tapinoma sessile Say.

Tribe *Poneridae.*

Ponera coarctata Latr., subsp. pennsylvanica Buckl.
Stigmatomma pallipes Hald.

Tribe *Myrmicidae.*

Myrmecina latreillei Curt., subsp. americana Em.
Myrmecina latreillei Curt., var. brevispinosa Em.
Monomorium minutum Mayr., var. minimum Buckl.

Monomorium pharaonis L.
Solenopsis molesta Say.
Pheidole pilifera Rog.
Stenamma brevicorne Mayr.
Aphaenogaster tennesseensis Mayr.
" fulva Rog.
Myrmica rubra L., var. sulcinodoides Em.
" " subsp. scabrinodis Nyl.
Myrmica rubra var. sabuleta Meünert.
" scabrinodis var. schencki Em.
Tetramorium caespitum L.
Cremastogaster lineolata Say.

Tribe *Cryptoceridae.*

Strumigenys sp.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXVI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Alsophila pometaria Harr. (*autumnata* Pack.). This injurious larva has been described in a general way by the principal writers on economic entomology and its habits have been made known. Eggs were received at the Department of Agriculture from W. R. Smith, having evidently passed the winter. They hatched April 18th and were matured in May. Wild larvae have been found by me as late as June 6th at Bellport, N. Y., feeding on oak and hickory. The present larvae were fed on apple.

Egg. Laid in a dense mass twice as long as broad, reaching half way around a twig. Subcylindrical, flattened, basal end a little rounded, slightly annularly bulging; micropylar end truncate, broadly rimmed, the center elliptical, a little depressed with a micropylar depressed dot. Surface slightly shining, obscurely reticulate, the truncate end irregularly shagreened, sometimes doubly ringed. Leaden gray, uniform for a single egg, though the flat topped mass looks a little mottled. Size .6×.55×.4 mm.

Stage I. Head round with full lobes, broadened above, the mouth projecting, the clypeus rather high, held nearly erect; pale luteous, the sutures narrowly and the posterior rim of lobes and mouth brown; ocelli black; width .3 mm. Setae short and pale with bulbous tips, most distinct on the body. Moderate, rather robust, not elongated, the central segments not longer than thick. Feet normal, moderately developed, but a very short, unused pair on joint 9 marked in black like the plantae of the other abdominal feet. Shields membranous; cervical shield divided into two semicircular parts, the flat side anteriorly, smoky, darker on the edges, bordered by blackish tubercles; anal plate and leg shields unmarked, faintly smoky. Body greenish yellow, striped with smoky blackish in broad dorsal (reaching but not enclosing tubercles i and ii), broad subdorsal and a broad shade below the subventral fold, diffused ventrally. Tubercles distinct, rounded, little elevated, black in pale rings. Thoracic feet pale, faintly smoky. With growth the dark shades become fainter and the larva looks green with obscure paler lines.

Stage II. Head rounded, erect, slightly bilobed, flattened before; very pale green, immaculate or the lobes faintly gray shaded; width about .6 mm. Ocelli black, not large; clypeus rather high. Body cylindrical, normal, not elongated; feet normal with a short, unused pair on joint 9, which, however, bear crochets; claspers pale. Tubercles slightly elevated but concolorous, not contrasted; setae short, pale. Green with scarcely paler whitish lines, the space between more or less distinctly shaded with blackish. The lines are subdorsal, double, the upper narrow, obscure; lateral; subventral, a shade on the fold. Feet pale; spiracles black.

Stage III. Head rounded, slightly bilobed, a little oblique, whitish, faintly green, immaculate or with gray-green reticulations on the inner sides of the lobes; width 1.1 mm. Body as before, pale green, white lined, subdorsal, lateral and broad substigmatal of pale greenish white, the spaces between, especially the broad dorsal one, more or less darkly shaded with grayish black, the venter not connectedly so. Cervical shield dark, anal plate pale. Tubercles elevated, rounded, distinct but concolorous; setae short, stiff, dusky, i and ii in line, iii rather before the spiracle, iv at the lower corner, v before and vi behind, vii a group of three setae, not scattered; all normal and Noctuiform, the segment not being elongated. Abdominal feet of joint 9 well formed but small. Spiracles black ringed; subventral tubercles blackish; thoracic feet pale.

Stage IV. Head whitish green; width 1.8 mm. Body smooth, green, setae small, pale obscure; dorsal vessel dark; a distinct, straight, white subdorsal line, the dorsal space with irregular, crinkled, dotted, white marks; a narrow lateral white line, the space above obscurely white blotched; white mottlings stigmatally and subventrally scarcely segregated into a line above the subventral fold. Spiracles finely black ringed. The larvae rest out straight on the back of a leaf. The feet on joint 9 have five long crochets on the posterior side, those of 10 have a set of hooks before and behind, broken on the inside by the large planta.

Pupation in the earth, the moths emerging the fall of the same year. Specimens from Lily Lake, Ill., and Bellport, N. Y.

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PSYCHE.

THE SPECIES OF GRYLLUS ON THE PACIFIC COAST.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The basis of this study is the collection of crickets made a few summers ago by Mr. A. P. Morse, from Victoria, B. C., to San Diego, Cal. I have used also the material previously in my collection. I have seen no specimens from Alaska.

The species found here are four in number and may be separated by the following table.

Table of the species of Gryllus found on the Pacific Coast, north of Mexico.

a[1]. General effect of coloring fuscous or black. Lower margin of lateral lobes of pronotum arcuate, a little oblique; branches of mediastinal vein of tegmina generally three, sometimes four in number; tympanum of outer face of fore tibiae elongate, much more than twice as long as broad, of inner face long ovate or elongate; upper inner calcar of hind tibiae distinctly, sometimes much, shorter than the intermediate calcar.

b[1]. Tegmina very dark testaceous, fully as long as the body, the wings, except rarely, much longer; pronotum nearly twice as broad as long, the hind margin faintly angulate; upper inner calcar of hind tibiae scarcely more than half as long as intermediate calcar . . . . *integer.*

b.[2] Tegmina black, very rarely as long as the body, the wings not surpassing them except in such cases; pronotum not more than half as broad again as long, the hind margin straight; upper inner calcar of hind tibiae fully three fourths as long as intermediate calcar.

c[1]. Somewhat larger. Tegmina generally shorter than the body, especially in the female, with light-colored humeral stripe, especially distinct in the female, the apical area beyond the male tambourine almost as long as its basal breadth; pronotum more villous; femora considerably stouter; generally six spines on inner side of hind tibiae. . . . . *vocalis.*

c^2. Somewhat smaller. Tegmina always shorter than the body, without humeral stripe, the apical area beyond the male tambourine much shorter than its basal breadth; pronotum less villous; femora not so stout; generally five spines on inner side of hind tibiae. . . . . . *pennsylvanicus.*

a^2. General effect of coloring testaceous. Lower margin of lateral lobes of pronotum straight and distinctly oblique; branches of mediastinal vein of tegmina at least four in number; tympanum of outer face of fore tibiae not (or but little) more than twice as long as broad, of inner face subcircular; upper inner calcar of hind tibiae scarcely shorter than intermediate calcar. . . . . . *assimilis.*

Gryllus integer sp. nov.

Moderately slender, not very large, with piceous body. Head rather large and full, but with the vertex not prominent, no broader than the pronotum, wholly black. Pronotum delicately and briefly villous, nearly twice as broad as long, with nearly parallel sides, the front margin truncate or faintly and broadly emarginate, the hind margin faintly and roundly angulate, with a feeble median impressed line not reaching the hind margin, the lower margin of the lateral lobes a little oblique and arcuate. Tegmina fully as long as the abdomen in both sexes, nearly uniform dark testaceous, the mediastinal vein with three or four branches; wings, except rarely, caudate. Legs black or blackish fuscous, the hind tibiae more or less tinged with testaceous, the hind femora moderately stout only, the hind tibiae rather short, commonly with five spines on the inner margin, the upper inner calcar scarcely more than half as long as the intermediate calcar. Ovipositor considerably longer than hind femora.

Length of body, ♂, 18 mm., ♀, 17 mm.; pronotum, ♂, 3 mm., ♀, 3.5 mm.; breadth of same, ♂, 5.75 mm., ♀, 6 mm.; length of tegmina, ♂, 12.5 mm., ♀, 10 mm.; hind femora, ♂ ♀, 10 mm.; ovipositor, 13.5 mm.

11 ♂, 8 ♀. West Berkeley, Cal., Aug. 20 (Morse); San Francisco, Cal., Aug. 19 (Morse); South Santa Monica, Cal., July 30 (Morse); Los Angeles, Cal., July 29 (Morse); San Diego, Cal. (Crotch); California (Edwards). I have also specimens (not used in describing) from San Francisco (Edwards); Sonoma and Marin Cos. (Osten Sacken), and Santa Barbara, Cal. (Cooper); as well as from Oregon (Edwards); New Mexico: Mesilla (Cockerell, Morse), Las Cruces (Cockerell), Ft. Buchanan (Nevin), and Organ Mts. (Wooton); Colorado: southern Colorado (Carpenter); and Texas: Pecos River (Pope), Dallas (Boll), San Antonio (Palmer), Gulf Coast (Aaron), and central Texas (Belfrage). I have both macropterous and brachypterous forms from all these states, excepting Colorado, from which I have only brachypterous.

It differs from the other Pacific coast species in the contrasted color of pronotum and tegmina, and further from *G. pennsylvanicus* in the broader pronotum and in that the frontal suture of the head is broadly and uniformly obtusangulate and not centrally rectangulate.

Gryllus vocalis sp. nov.

Moderately stout, moderately large, with piceous body. Head rather large with prominent vertex, a little broader than the pronotum, wholly black. Pronotum delicately and briefly villous, about a third as broad again as long, broadest in the middle by the gently and regularly convex sides, the front and hind margins truncate, with a median impressed line failing to reach the hind margin, the lower margin of the lateral lobes a little oblique and arcuate. Tegmina nearly covering (♂), or somewhat shorter than (♀) the abdomen, black with a fulvous or flavous humeral stripe especially distinct in the female, the apical area beyond the male tambourine almost as long as its basal breadth, the mediastinal vein with three branches; wings generally no longer than the tegmina, but sometimes surpassing a little the abdomen. Legs black, the hind pair more or less ferruginous especially in the female, the hind femora stout, the hind tibiae with generally six spines on the inner side, the upper inner calcar fully three fourths as long as the intermediate calcar. Ovipositor about as long as the hind femora.

Length of body, ♂, 21.5 mm.; ♀, 21 mm.; pronotum, ♂, 4.5 mm., ♀, 4 mm.; breadth of same, ♂, 6 mm., ♀, 5.25 mm.; length of tegmina, ♂, 12 mm., ♀, 10 mm.; hind femoral ♂ ♀, 13 mm.; ovipositor, 12.5 mm.

6 ♂, 3 ♀. Palm Springs, Cal., July 13, 14 (Morse); Los Angeles, July 29 (Morse).

In this species, the tegmina of the male are almost as long as the abdomen and the wings usually no longer; in the female the tegmina are considerably shorter than the abdomen and the wings short so far as seen. It differs from the other species by the distinct humeral stripe of the tegmina, especially distinct in the female, and in its stouter legs. It further differs from *G. integer* in the color of the tegmina, their lesser length and shorter postspecular area, and in the narrower pronotum which is less villous; and from *G. pennsylvanicus* (as occurring on the Pacific slope) in size, in the rather broader pronotum, which is less villous, and its longer postspecular area of the tegmina.

Gryllus pennsylvanicus.

Gryllus pennsylvanicus Burm., Handb. ent., ii, 734 (1838).

This is the most widely distributed species of Gryllus in the United States and appears to be the only Atlantic species * found on the Pacific coast, where it is much more common in the north than in the south. Mr. Morse brought home specimens from Victoria, B. C., Sept. 29; Tacoma, Sept. 25, and Tenino, Wash., Sept. 24; Drain, Sept. 11, Divide (Cottage Grove), Sept. 12, Corvallis, Portland, Sept. 19, and Philomath, Or., Sept. 15; and Lancaster, Cal., July 31. I have besides seen specimens from Vancouver Isl. (Edwards), British Columbia (Crotch), Oregon (Edwards), and the following localities in California — Mt. Shasta, Soda Springs, San Francisco (Edwards, Behrens), Santa Barbara (Edwards), Colorado River, July 28 (W. Somers), Mohave River (Palmer), San Diego (Crotch, Webb).

It is more uniformly black than any of the other California species and differs from all of them in its shorter tegmina and always (so far as I have seen them) short wings; it is also peculiar for the bent-arcuate rather than simply

* Unless *G. assimilis* is found on the Atlantic coast

arcuate fiddle-bow of the male tegmina. Though found by Mr. Morse at numerous localities it was nowhere taken by him with any of the others.

Gryllus assimilis.

Acheta assimilis Fabr., Syst. ent., 280 (1775).

Gryllus (*Acheta*) *assimilis* Goeze, Ent. beytr., ii, 87 (1778).

Gryllus assimilis Oliv., Encycl. méth., vi, 634 (1791).

Both long-winged and short-winged forms occur. It was taken by Mr. Morse in California only, at Raymond, Aug. 16, South Santa Monica, July 30, and Palm Springs, July 13.

It differs from the others at first glance by its general testaceous coloring, and differs also in the straight oblique cut of the lower margin of the lateral lobes of the pronotum and the greater length of the upper inner calcar of the hind tibiae. The only United States specimens which I have seen are from California.

SOME NEW RECORDS OF THE NEW ENGLAND FORMICIDAE.

BY GEO. B. KING, LAWRENCE, MASS.

So little is known of the geographical distribution, and in fact the existence of our ants, even in a general way, that it seems very important to record any information bearing upon any new localities for the various known species. And any fact treating upon their peculiar habits is always interesting. Dr. George Dimmock collecting in Springfield, Mass., and vicinity for *Coleoptera* larvae in a quiet way as opportunity would permit, sent me such ants as he found from time to time. The following notes, therefore for the most part, are the results of his labors. Where no further locality is given, Springfield should be understood.

Camponotus laevigatus Em.

" *castaneus* Latr. subsp. *americanus* Mayr. (Mt. Tom, Mass.).

Camponotus herculaneus L.

Camponotus herculaneus L. var. *pictus* For. (Mt. Tom, Mass.).

Camponotus herculaneus pennsylvanicus De Geer.

Camponotus marginatus var. *nearcticus* Em.

Formica sanguinea Latr. subsp. *rubicunda* Em. (Springfield and Holyoke, Mass.).

Formica rufa L. var. *obscuripes* For. (Mt. Tom, Mass.).

Formica rufa subsp. *integra* Nyl.

" *exsectoides* For. (Mt. Tom, Mass.).

Formica pallide-fulva Latr. (Mt. Tom, Mass.).

Formica pallide-fulva, subsp. *schaufussii* Mayr. (Mt. Tom, Mass.).

Formica fusca L. var. *subsericea* *Say.* (Mt. Tom and Springfield, Mass.).

Lasius niger L. var. *americanus* Em. (Mt. Tom and Springfield, Mass.).

Lasius niger var. *neoniger* Em. (West Springfield, Mass.).

Lasius flavus Mayr. (Mt. Tom, Mass.).

" *claviger* Rog. (Springfield and West Springfield, Mass.).

Prenolepis imparis Say.

Tapinoma sessile Say (Springfield and Mt. Tom, Mass.).

Ponera coarctata, subsp. *pennsylvanica* Buckl. (Mt. Tom, Mass.).

Monomorum pharaonis L. (Springfield, Mass.) Det. Dimmock.

Pheidole pilifera Rog. var. (West Springfield, Mass.). Taken by Mr. Fred Knab.

Aphaenogaster tennesseensis Mayr. (Mt. Tom, Mass.).

Aphaenogaster fulva Rog. (Mt. Tom and Springfield, Mass.).

Tetramorium caespitum L. (Springfield, Mass.) Det. Dimmock.

Cremastogaster lineolata Say. (Springfield, West Springfield, Belchertown and Mt. Tom, Mass.).

The following species Dr. Dimmock has found in Connecticut:—

Formica pallide-fulva subsp. *schaufussii* Mayr.

Formica fusca L. var. *subsericea* Say. (Suffield, Conn.).

Cremastogaster lineolata Say (Suffield, Conn.).

Stigmatomma binodosum Prov. (Suffield, Conn.) Seemingly a very rare species, recorded from Canada. I think this is the first record of its being found in the U. S. This species and *S. pallifera* Hald. which we find in Mass. are the only two species of the genus found in North America. The genus contains ten species.

The other species previously recorded from Conn. are *Myrmica scabrata* Buckl., *Formica americana* Buckl., *F. gnava* Buckl., *F. schaufussii* Mayr., *F. subsericea* Say (Hartford), *F. exsectoides* For. (Hartford and Cromwell), *F. rubicunda* Em. (Cromwell) and *Polyergus lucidus* Mayr.

I may also permit myself to record some ants found by me in New Hampshire, while on brief collecting trips. The following were all found at Canobie Lake, N. H.: *Camponotus pennsylvanicus*, *C. pictus*, *Formica exsectoides*, *F. subsericea*, *F. pallide-fulva*, *F. integra*, *F. rubicunda*, *Lasius americanus*, *L. neoniger*, *L. flavus*, *L. claviger*, *Tapinoma sessile*, *Stigmatomma pallipes*, *Solenopsis molesta*, *Aphaenogaster fulva* and *Cremastogaster lineolata*. August of this year while on a brief vacation at West Ossipee, N. H., these species were observed. Near the base of Mount Whittier were *Formica subsericea*, *Aphaenogaster fulva*, *Lasius flavus*, and *Solenopsis molesta*, the latter living at one side of a nest with *Aphaenogaster fulva*. *Lasius americanus* was quite common in the grass fields and along the road sides. Near the top of Ossipee Mountain were a few small nests of *Lasius flavus* and *Formica subsericea*. I had however very little time for observation.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.—V.

At the end of June, 1901, a further exploration of the Hudsonian Zone was made resulting in a number of additions to the list of insects occurring there. The locality, as before, was the top of the Las Vegas Range, between the Pecos and Sapello Rivers, at an altitude of about 11000 ft.

The exact locality of the moth doubtfully reported as *Stenoptilia exclamationis* was revisited, and perfect specimens of what is presumed to be the same species were taken. A preliminary examination shows that they belong to *Platyptilia*, and are very near *P. cosmodactyla*, a species originally described from Europe.

The principal addition to the list of butterflies was *Chionobas chryxus*, which was quite abundant in an open rocky meadow. This must be its southern limit. A single *Thanaos* was taken June 27; Dr. Skinner identifies it as *T. persius* Scudder, ♂. The species goes north to Montana.

Culex impiger Walk., was found breeding in quantities, this being perhaps the highest altitude at which mosquitoes have been observed to breed.

A great surprise was the capture of a single worn example of *Terias mexicana*. This insect is known as a great wanderer, and of course does not breed in any boreal zone. A tattered *Euptoieta claudia* was also secured.

An addition to the list of bumble-bees was *Bombus appositus*, which is common in the Canadian zone below.

T. D. A. COCKERELL.

MICROLEPIDOPTERA.

The following, collected at the end of June, 1901, were kindly identified by Mr. Aug. Busck. Unfortunately they were in poor condition.

Gnorimoschema sp. (possibly *triocellella*).

Gnorimoschema sp. (nov.?) Also seen by Mr. Busck from Colorado.

Plutella maculipennis Curtis.

Coleophora sp.

Monopis sp. (probably *rusticella* Hbn.)

HYMENOPTERA.

BY HENRY L. VIERECK.

The following is a list of interesting records furnished by specimens collected by Prof. T. D. A. Cockerell on top of the Las Vegas Range, N. M. (alt. 11000 ft.).

Fam. CRABRONIDAE.

Ectemnius montanus Cr., one ♂, June 27.

Ectemnius parvulus Pack. one ♂, June 27.

Xestocrabro sexmaculatus Say, one ♀, June 29.

Xestocrabro trifasciatus Say, one ♂, June 27.

Fam. PEMPHREDONIDAE.

Mimesa cressonii Pack., one ♀, June 27.

Fam. SPHEGIDAE.

Psammophila luctuosa Sm., one ♀, June 27.

Fam. POMPILIDAE.

Pompilus tenebrosus Cr., one ♀, June 26.

Pompilus lepidus Say, one ♀, June 29, described from Mexico, other specimens in the Collection of the American Entomological Society are from Florida and Colorado.

Fam. SAPYGIDAE.

Sapyga centrata Say, one ♂, June 27.

Fam. EUMENIDAE.

Odynerus fraternus Say, one ♂, June 27.

Fam. SELANDRIIDAE.

Poecilostoma inferentia Nort., one ♂, June 27.

Fam. TENTHREDINIDAE.

Tenthredopsis attractus Nort., one ♀. Smaller than Norton's unique type (in Coll. Am. Ent. Soc.) from the English River, Canada.

Tenthredo nupera Cr., one ♂, June 29

Labidia originalis Nort., two ♀, June 27.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXVII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Sabulodes transversata Drury. The mature larva has been figured and described by Peale, Packard, Goodell and Bruce.

Egg. Elliptical, flattened above and below, truncation rather large and marked, the other end depressed. Shining light green, turning dark red. Nearly smooth, the reticulations fine, obscure, rounded hexagonal, nearly obsolete and not raised, the angle pores showing as faint whitish dottings, slightly roughening the surface. Size .9×.7×.6 mm. Hatched in nine days. Laid adherent to the surface.

Stage I. Head rounded, flattened before, mouth squarely projecting. Dark, sordid, luteous brown, darker on the sides; slightly bilobed; held obliquely. Body slender, cylindrical, moderately elongate, greenish white on the sides, dorsally and ventrally broadly striped in purplish brown, the dorsal band widened a little on the prothorax. No shields; tubercles and setae minute. Feet dark brown, normal.

Stage II. Much as before. Head dark brown, epistoma paler; width .6 mm. Body slender, dark brown dorsally and ventrally, the dorsal band with traces of pale subdorsal linings. Sides sordid white, greenish from the food; tubercles and setae minute; feet dark. The head is rounded, scarcely bilobed, clypeus depressed, mouth squarely and shortly projecting; antennae distinct, pale.

Stage III. Head squarely rounded, slightly bilobed, obliquely erect; heavily brown reticulate, solidly shaded over the face, partly whitish on the sides; antennae pale; width 1.1 mm. Body moderately elongate, normal; dorsum and venter broadly brown, finely lined in an obscure paler shade, the venter diluted with greenish, strongly brown only centrally. Subventral fold broadly greenish white. Feet pale, the abdominal ones dark marked within.

Stage IV. Head rounded, scarcely bilobed, erect, free; uniformly dark brown, the antennae whitish; width 1.5 mm. Body moderate, normal, angled dorsally at joint 3; tubercles ii of joints 8 and 12 on a rounded papilla, the other tubercles slightly or not prominent. Brown, dark dorsally, wood-brown and yellowish ventrally, finely waveringly and narrowly lined in dark brown; subventral fold sordid bluish white on joints 5 to 10; a white stigmatal band on joints 2 to 4 and 10 to 13, composed of a vague shading through which run fine whitish lines. Feet colored like the venter, those of joint 13 with a white line. Spiracles black ringed. Tubercles and setae black, the latter short.

Stage V. (interpolated.) Head rounded, flattened, sometimes held flatly; mouth short, antennae small. Brown, obscurely mottled with darker; a pale line at the base of the clypeus to ocelli, the sides below and labium pale; width 2.1 mm. Body flattened cylindrical, thoracic feet moderate, appressed, the abdominal ones large. Tubercle ii of joint 8 conically produced, of 12 similar, but the pair more approximate, a pair of subanal prongs; else smooth, the other tubercles not elevated. Brown, the dorsum uniformly and smoothly so except in a distant white half-ring before the lump on joint 8 and whitish fine linings on the thorax and joints 10–13. Subventral fold narrowly whitish lined; venter pale, blotched in red, finely dark lined and with the tubercles dark. Venter of joints 10–13 broadly whitish; a series of medioventral elongate, dark brown patches.

Stage VI. Less smoothly purplish brown, more wood-brown, and more lined dorsally. Head 2.6 mm. Reddish and white points at the dorsal tubercles. Joint 3 held in a collared shape, lumpy on the sides and red streaked there. Feet bunched and head held erect or else the head held flatly without the collared prominence on thorax. Half ring before the lump on joint 8 distinct, white, the tubercles ii of this segment dark. Dorsum of joint 12 also with a pair of prominent tubercles; subventral fold raised. When fully fed the color became a light wood brown. Cocoon of a few coarse threads between leaves. Probably at least double brooded. Larvae from Bellport, New York, the eggs August 7, mature larvae September 12th. Fed readily on apple, the natural food plant not determined.

BIBLIOGRAPHICAL NOTES.—X.*

By Samuel Henshaw.

Biologia Centrali-Americana.— Orthoptera. Vol. 1. By Henri de Saussure, Leo Zehntner, A. Pictet, and A. de Bormans.

	gen.	sp.
Forficulidae, 1893, pt. 110, 111, p. 1–12.	14	41
Blattidae, 1893, pt. 111–113, p. 13–104; 1894, pt. 114, p. 105–123.	44	156
Mantidae, 1894, pt. 114–117, p. 123–197.	25	61
Gryllidae, 1894, pt. 117, p. 198–200; 1896, pt. 132, p. 201–216; 1897, pt. 133–135, p. 217–284.	34	106
Locustidae, 1897, pt. 135–139, p. 285–344; 1898, pt. 140, 142, 144, 145, p. 345–456; 1899, pt. 146, p. 457–458	87	272

Nine genera and 79 species of Blattidae, 12 genera and 53 species of Mantidae, 3 genera and 25 species of Gryllidae, and 20 genera and 107 species of Locustidae are noticed in the text that are not included in the above enumeration; these represent allied extralimital forms.

Of the 636 species recorded from Central America, 2 Forficulidae, 7 Blattidae, 6 Mantidae, 17 Gryllidae, and 14 Locustidae, a total of 46, are found in America north of Mexico.

Species of the following genera are figured:—

Forficulidae.— Ancistrogaster, 2. Anisolabis, 1. Diplatys, 1. *Echinopsalis, 1. Forficula, 2. Labia, 1. Neolobophora, 2. Opisthocosmia, 1. Psalis, 1. Sparatta, 1. Sphingolabis, 2. Spongophora, 2.

*For IX see Psyche viii, 141.

New genera are preceded by an *; the figure after the name of the genus indicates the number of the plate.

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The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

ON THE LARVAL FORMS OF SEVERAL EXOTIC CERATOCAMPID MOTHS.

BY A. S. PACKARD, PROVIDENCE, R. I.

The larvae here described are of moths heretofore referred to the family Saturniidae. They are however members of quite another group, a great family or superfamily of which the Ceratocampidae of the older authors (Citheroniidae) Agliinae and perhaps four or five other groups are components. For example, Nudaurelia, of which there are about twenty species, and which were confounded with Antheraea, until separated by Rothschild, is, though an African genus, both in its imaginal and larval characters allied to our American Ceratocampids. This is also the case with *Gynanisa isis*, and *Urota sinope*. I might also add that after a prolonged study of the venation and other characters, besides what little we know of the larval histories, I have come to the conclusion that many other genera heretofore referred to the Saturniidae, will have to be removed from that family, and placed in this group. Apparently none of these genera are spinners but, like Citheronia, Eacles, Anisota, Sphingicampa, etc., enter the earth to finish their transformations, and spin no cocoon.

The group as we are now disposed to limit it is divided into about six subfamilies, and comprises about thirty five genera, including the five genera (*Syssphinx*, *Sphingicampa*, *Anisota*, *Eacles* and *Citheronia*) usually referred to the Ceratocampidae. The Eurasian genus *Aglia* is a type of the subfamily *Agliinae*, and does not belong with the Saturniidae, though universally referred to that family, but falls into the group under consideration. The following genera with the six provisional groups referred to, by their imaginal characters, *i. e.* the venation, antennae, etc., as well as what we know of their transformations, should be taken out of the Saturniidae and associated with the Ceratocampidae (Citheroniidae): —

Besides (1) the Citheroniidae, there is

2. A group represented by Micrattacus, Lugia, Bolocera, and Sagana.

3. A group (Agliinae) represented by Arsenura, Rhescyntis, Aglia, Cercophana, Cirina, and Usta, with a side genus Polythysana.

4. A group comprising Dysdaemonia and Copiopteryx, and perhaps Titaea and Loxolomia.

5. A group represented by Eudaemonia, Urota, Eudelia; and finally (6) a group containing the following genera, Bunaea, Imbrasia, Gynanisa, Salassa, Nudaurelia, Antherina, Melanocera, and Cinabra, with two undescribed genera, one represented by *Bunaea phaedusa* and another by *Nudaurelia belina.*

It will be a matter of interest to consider the geographical distribution of this great group, now comprising some thirty-six (probably forty) genera.

All but two genera (Aglia and Salassa) the former Eurasian, the latter Asiatic, are either Neogaeic (Central and South American) or Ethiopian (Equatorial and South African). Of these thirty-four (perhaps 36–38) genera, seventeen are African, and about the same number (15–16, perhaps 18) are South American. This fact in the distribution of the group is of interest in connection with the relations between the South American and African flora and fauna, of which so much has recently been written, confirming the view that perhaps at the close of the cretaceous period and through the early tertiary there may have been a land connection between the two continents.

There are about thirty genera of Saturniidae; of these we know the larval forms of seventeen genera. But of the larger group in question we know the larval stages of but thirteen genera and that very imperfectly. Besides the larva of a single species of Nudaurelia, of Gynanisa and of Urota, we know only that of *Thyella zambesia* roughly figured by Maassen and Weymer, of *Bunaca alcynoe* briefly described by Aurivillius, that of the Eurasian Aglia and the South American forms Cercophana, Rhescyntis, Arsenura, and the Ceratocampid genera Syssphinx, Sphingicampa, Anisota, Eacles and Citheronia, or thirteen genera.

In this great family whose larvae are so sphinx-like in general shape, in the form of the anal legs, head, and other features, besides the pupa and subterranean habits the name Sphingicampidae may be suggested. The name Ceratocampidae might be used in an extended sense but by the present rules its use is unfortunately forbidden.

Nudaurelia dione (Fabr.).

Larva.— Head as in *Gynanisa isis*, large, smooth, but dull black, shining but a little, and seen to be finely granulated under a lens, the granulations grouped in lines. Head a little more than one-half as thick as the body, which is cylindrical, not quite so thick as in Gynanisa. The body is uniformly dull velvety black, except the groups of yellow warts. Prothoracic shield black, roughly corrugated transversely, with no spines, but a simple pale dorsal hair on each side.

Second thoracic segment with four large chestnut-brown spines, the two middle ones nearly twice as long as the outer ones, and bearing one or two minute short tines or tubercles each of which gives rise to a white hair. The spines of the 3d thoracic segment are of the same size and reddish testaceous color as those of the abdominal segments; they are very sharp, strong and constitute a most formidable armature. Those of the infraspiracular row are darker. Each dorsal spine gives rise to from 3 to 5 slender fine pale hairs. The spines are curved backwards, those of the dorsal rows are directed a little inward.

The single median spine in the 8th segment is wide, deeply cleft, or forked, with the base enlarged. On each abdominal segment between the dorsal and supraspiracular row of spines is a group of from 3 to 6 irregular, flattened ruffle-like or fungoid bright yellow warts, the number on the 8th abdominal segment being reduced to two round crateriform ones, like a tart or fungus.

Spiracles conspicuous, bright testaceous or luteous. Suranal plate large rounded triangular, the surface irregularly roughly corrugated but unarmed. Thoracic and abdominal, including the anal, legs dull black, anal legs rather large sphingiform, black, the surface rough. Under side of the body black, with no warts or other markings.

Length 78 mm.; thickness of the body 12 mm.; width of head 7 mm.

A remarkably spiny larva, with a most formidable armature of very sharp slightly recurved long spines, while the head and body are dull black. The groups of yellow warts would render it a very conspicuous object. It would be interesting to know whether it feeds exposed on trees.

This is another example of the occurrence of very dark or black caterpillars in the tropics, a circumstance as yet to be explained.

Described from a blown example from "Natal" received and labelled as above from Messrs. Staudinger and Bang-Haas.

This variable species is distributed throughout equatorial and southern Africa. According to Sonthonnax * the larva transforms in the earth, without spinning a silken cocoon, at a depth of two or three inches; the "transformation" or resting period lasting six months.

* Essai de classification des Lépidoptères producteurs de soie. (3e fascicule) Lyon, 1901.

Gynanisa isis Westwood.

Larva. — Body cylindrical, thick, a large thick spiny caterpillar. Head about one-half as thick as the body; surface unarmed, with short minute wrinkles or corrugations; pale olive green; a short black line on each side of the clypeus, the anterior division of which bears a low conical tubercle situated each side of a median smooth ridge.

Prothoracic shield distinct, of the usual lunate shape, unarmed, the surface nearly smooth, only slightly corrugated, and the front edge shining jet black; on the side of the segment directly in front of the spiracle is a low thick tubercle, and lower down a few simple flattened pale warts.

Second and third thoracic segments each with two dorsal tubercles, not erect but flattened and adhering to the skin on the basal two-thirds; they are pointed inward towards each other, with the ends erect, but rounded, not ending in a spine; those of the third are a little larger than those on the second segment. A supraspiracular and an infraspiracular smaller minute tubercle, a continuation of the three rows of similar tubercles on the sides of the abdominal segments. These two segments are crossed by three irregular rows of irregular flattened pale tubercles.

On abdominal segments 1 to 7 are six rows of large tubercles (three on each side of the body) inclined inwards and backwards towards the median line of the body, and larger than those on the thoracic segments, each ending in a stout sharp point. The two dorsal spines of each segment are tipped with black, the small lateral ones not thus tipped. These spines are all smooth and bear no setae. In the neighborhood of and behind each spiracle is an irregular group of 5 to 6 elongated oval crateriform warts, and two between the dorsal spines on the first three abdominal segments.

On the 8th abdominal segment is a single median stout short spine, not so long as those in front, but deeply cleft or forked at the end, each fork acute and diverging from its mate. Around the base of the spine are about sixteen pale flattened circular smooth warts.

Suranal plate subtriangular, apex much rounded, with about a dozen solid thick black tubercles, each giving rise to a short minute seta; they are mostly collected around the end of the plate. A lateral reddish line. Thoracic legs stout, pale, black at the sutures between the joints. Abdominal legs reddish below, dark on the planta. Under side of the body speckled with fine oval setiferous pale warts. Anal legs large, their sides triangular in shape, bright yellow, the lower edge or plantar region shining jet-black. Spiracles pale sienna brown.

Length 77 mm.; thickness 15 mm.

Described from a blown specimen from Natal, received from Staudinger and Bang-Haas.

Urota sinope Westwood.

Larva. — Described from a blown example from Natal received from Messrs. Staudinger & Bang-Haas. Head large round smooth, surface dull brown-black, not polished, unarmed. Body cylindrical, neither humped or conspicuously tuberculated. A prothoracic plate on each side bearing a pair of pale setae which are short, slender, arising from an inconspicuous flattened tubercle (not easily detected in a blown example) situated as are all the thoracic and abdominal ones on the hinder edge of the segment. On abdominal segments 1 to 7 are two widely separated rows of minute flattened tubercles giving rise to a pair of slender flattened setae which are pale at the base and darker toward the tip; there is also a lateral row (there are in all as in the family in general 3 rows of tubercles on each side of the body). The setae are in groups of from 2 to 5, each seta arising from a separate minute secondary tubercle; the setae are about $\frac{1}{6}$ as long as the body is thick. On the 8th abdominal segment there is no median tubercle, but 2 groups of 4 rather long setae each arising from minute separate bases; they are white, slender, curved; each group situated not far from the median line. On the side of the body below and behind the spiracle, though close to it, is a group of 3–4 setae. On the 9th segment are 3 sets of similar setae arranged as on the 8th segment; those on the sides below the spiracles are longer than those above. Spiracles black. Thoracic and abdominal legs blackish. Anal legs of moderate size. Suranal plate with three groups of rather long setae on each side; the plate rounded, surface convex and a little corrugated. Base of abdominal legs (1–4) reddish. The skin rough, finely granulated. Thoracic segments 2–3 and abdominal ones with a transverse band of coarse pale yellowish flattened granulations, smooth, the band on the side widening and surrounding the spiracles. Length 55 mm., thickness 9 mm.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO. — VI.

HYMENOPTERA APOIDEA. II.

BY T. D. A. COCKERELL.

The following, taken on the top of the Las Vegas Range at the end of June, 1901, are additional to the previous list. (*Psyche*, Feb. 1901, p. 163.)

Bombus appositus, Cresson. 1 ♀.

Anthophora cardui, Ckll. 1 ♂. I was surprised to find this at such an altitude.

It is doubtless the same insect which has been reported from New Mexico as *A. smithii*, Cresson, and I am not positive that it should be separated from that species.

Megachile willughbiella (Kirby). 2 ♂. This European species has not hitherto been reported from America, but the males before me agree exactly with examples from Mr. Friese, collected at Lugano, June 25, 1884. The insect resembles a good deal the male of *M. latimanus*, but is smaller, with the four hind legs practically normal, and the anterior femora have a short oblique keel on the outside near the apex. I have other New Mexico specimens, one from Las Vegas, June 6 (N. E. Cochran); six from the Rio Ruidoso, collected by C. H. T. Townsend. Of these last, three were collected July 29, at 6700 ft., on flowers of *Vicia* aff. *pulchella*; one Aug. 3, 7500 ft., on *Verbena macdougali*; one, July 22, 6900 ft., and one July 25, 6500 ft., the last two on *Monarda stricta*. The only objection to regarding these males as veritable *willughbiella*, rests in the fact that I have nothing American agreeing with the female of that species. The species which comes nearest to it, and looks like the female of the just mentioned males, is *M. monardarum*, Ckll. This differs from a ♀ *willughbiella* sent by Mr. Friese, in the black hair of the mesothorax, the pure white hair of the pleura and the ventral scopa not being black on the last two segments.

Osmia faceta, Cresson. 2 ♂. In fresh examples there is a good deal of black hair on the dorsum of the apical half of the abdomen, not mentioned by Cresson.

Osmia inurbana, Cresson. 1 ♂. Length 7½ millim. The specimen differs from typical *inurbana* in having the sixth abdominal segment only slightly emarginate; I was at first inclined to treat it as a distinct species, but a series of *inurbana* before me is so variable, that I hesitate to propose any segregation. The insect is also very like *O. albiventris*, but differs specifically in the broader face, perfectly black antennae, sixth abdominal segment not margined with testaceous, apical segment strongly bidentate, and the hind tarsi much broader, the first joint being twice as broad, and edged within by a short fringe of bright orange-fulvous hair. It is also very near to the European *O. versicolor*. *O. inurbana* is new to New Mexico.

Prosopis varifrons, Cresson. 1 ♂.

Prosopis basalis, Smith. 1 ♀.

Colletes nigrifrons, Titus. 1 ♀. New to New Mexico. Differs from a cotype received from Mr. Titus in having no black hair on scutellum, but is clearly the same species.

✓ *Andrena birtwelli*, n. sp.

♀. Length about 10 mm., black; head and thorax clothed with long, erect, grayish-white hair; black on vertex and hind part of cheeks; long, white and curled on each side of metathorax, where it forms a scopa filled with yellowish-white pollen. Head ordinary; facial quadrangle broader than long; area behind ocelli punctured; front below ocelli coarsely strigose; clypeus microscopically tessellate, with numerous large punctures, wanting in the middle line; process of labrum broad, emarginate; antennae fairly long, flagellum ferruginous beneath towards the tip; third antennal joint longer than 4 + 5. Mesothorax microscopically tessellate, quite dull, punctured; basal area of metathorax triangular, not bounded by a ridge, microscopically tessellate with a few irregular basal raised lines; tegulae shining dark brown; wings smoky, nervures piceous, stigma ferruginous edged with piceous; second submarginal cell little narrower above than below, third submarginal narrowed fully half to marginal. Legs black, small joints of tarsi dull ferruginous; hair of legs mostly pale, a black tuft on hind knees, basal joint of hind tarsi broad, with dark brown hair; abdomen oval, convex, shining, microscopically tessellate, with only minute very sparse punctures; first segment fringed at sides and apex with long but not dense white hair; remaining segments nearly naked, with some white hairs at sides, tending slightly towards band-formation; fimbria at apex pale brownish-gray.

1 ♀, June 27. It is named after Mr. F. J. Birtwell, the clever young ornithologist who was accidentally killed on the Upper Pecos the day following the capture of this insect. *A. birtwelli* appears to be related to *A. lapponica*, *A. frigida* and *A. convexa*, but is not identical with any of them.

Andrena merriami, n. sp.—

♀. Length about 10½ mm., black; pubescence all black except on mesothorax, scutellum and postscutellum, where it is pale ochraceous. Facial quadrangle broader than long; vertex dull, minutely roughened; clypeus microscopically tessellate, strongly punctured, the punctures sparse in the median line; antennae short, black, flagellum slightly brownish beneath; first flagellar joint a little longer than the next two together; process of labrum with sloping sides and emarginate apex; mesothorax dull, minutely roughened; enclosure of metathorax ill-defined, minutely roughened; sides of metathorax with black hair; tegulae very dark brown; wings smoky, nervures and stigma piceous; third submarginal cell long, narrowed more than half to marginal; abdomen shining, microscopically tessellate, with sparse punctures at the bases of the hairs; no hair bands, except black ones on the ventral surface; fimbria abundant and black.

One ♀, June 27. Named after Dr. C. H. Merriam, in recognition of his valuable work on the Hudsonian zone. *A. merriami* is something like *A. anograe* in miniature. In Schmiedeknecht's tables of palaearctic species, it runs to *A. albopicta*, Rad., but is not the same.*

Halictus virgatellus, n. sp.— ♀.

Length about 8 mm.; head and thorax very dark green; abdomen black with broad white hair bands on the apical margins of the segments; fimbria ochraceous. Facial

* The following species, closely allied to *A. merriami*, may be made known at the present time:—

Andrena washingtoni, n. sp.— ♀. Long, 10½ mm.; differs from *merriami* as follows: hair of metathorax and upper part of pleura (as well as mesothorax etc.) pale ochraceous (black on lower part of pleura, and pectus), the abundant curled floccus at base of hind legs beneath white, but just anterior to it a tuft of coarse black hairs, strongly contrasting; hair about mouth more or less pale (otherwise the hair of head is all black); first abdominal segment, and middle of second, with long pale hairs; process of labrum short and broad, strongly emarginate, one might say binodose; tegulae lighter brown; stigma dark ferruginous; third submarginal cell less produced apically; tibial spurs light ferruginous; small joints of tarsi, and pubescence of basal joints towards end, ferruginous.

Hab.— Olympia, Washington State, June 2, 1895. (*Trevor Kincaid.*)

quadrangle about square; clypeus rather strongly produced; antennae black, the flagellum faintly brownish beneath towards apex; mesothorax shining, densely and strongly punctured; basal area of metathorax coarsely wrinkled; tegulae very pale brown; wings smoky, nervures very dark brown, stigma lighter brown; hind spur of hind tibia pectinate.

Allied to *H. fasciatus* (as understood by Robertson), but larger, with the anterior knees and tibiae wholly black, the wings and their nervures much darker, the third submarginal cell much broader above (being narrowed less than half to marginal), the abdomen quite without an aeneous lustre, and with the bands snow-white. In both species the first flagellar joint is very short, hardly longer than the second. *H. virgatellus* is distinguished from *H. trizonatus* by its dark nervures and dense punctures.

Halictus hemimelas, n. sp.—

♀. Length about 7 mm.; head and thorax very dark olive green, legs and abdomen black, the latter with a purple tint about the middle of the second and third segments. Head somewhat elongated, facial quadrangle longer than broad; clypeus produced, black, with large sparse punctures; front dull, with excessively close punctures; antennae black, flagellum slightly brownish towards end; scape curved, long, almost reaching anterior ocellus; flagellum short; mesothorax minutely tessellate, with distinct punctures, not very dense in the middle; base of metathorax rugulose, not bordered by a sharp edge; tegulae shining piceous; wings smoky, nervures and stigma very dark brown; third submarginal cell short and high, narrowed less than half to marginal; legs with silvery-white hair; hind spur of hind tibia pectinate with only two well-formed teeth; abdomen shining, with extremely minute punctures, apical portions of the segments minutely transversely lineolate; elongate subtriangular white hair-patches at lateral bases of segments 2 to 4, much in the manner of *H. pectoraloides*; a good many white hairs on abdomen beneath and at apex; fimbria pale brownish.

One ♀, June 29.

Halictus dasiphorae, n. sp.—

♀. Length about 7 mm., general appearance of the last species, but wholly black, and the abdominal hair-patches are less pronounced, being more merged in the general pale pruinosity, especially after the second segment. The orbital margins on the inner side are not far from straight, whereas in *H. hemimelas* they are quite strongly concave. The form and sculpture of the head, the form of the antennae, and the sculpture of the mesothorax and metathorax, are about the same in the two species, but in *dasiphorae* the enclosure of the metathorax is longer, and the flagellum is fulvous beneath except at the apex. The wings of *dasiphorae* are dusky as in *hemimelas*, but the nervures and stigma are rather pale brown; the venation is about the same in the two species.

5 females. June 27.

H. dasiphorae cannot be the ♀ of *H. peraltus*, on account of its dusky wings with lighter nervures. It differs at once from *pectoralis* by the granulose (not ridged) base of metathorax, and more produced clypeus; from *gracilis* by the granulose (not cancellate) base of metathorax and dusky wings; from *subobscurus* by its larger size, dusky wings, second submarginal cell little narrowed above, etc.; from *similis* by its smaller size, third submarginal cell longer than second on radial nervure in (*similis* they are equal), and in the narrower head.

Halictus veganus, n. sp.—

♀. Length about 6 mm., brassy green, including the abdomen; legs black. This is very like *H. ruidosensis*, and has the more or less coppery or brassy tint on the supraclypeal area, but it is certainly a distinct species, presenting the following distinctive characters: — inner orbital margins less concave; basal area of metathorax much longer, and irregularly cancellate all over, especially at the sides; abdomen green (occasionally this is scarcely perceptible), with the first segment minutely transversely lineolate, with quite numerous if minute punctures; third submarginal cell narrower above. In both, the hind spur of hind tibia is pectinate with few teeth. The wings are faintly dusky, and the stigma is light brown.

7 females, June 27.

NEUROPTEROID INSECTS.

BY NATHAN BANKS.

Both of the two Neuropteroid insects collected at the top of the Las Vegas range in New Mexico appear to be undescribed; both belong to genera having many species in northern and boreal regions. One belongs to the Neuroptera, the other to the Trichoptera.

HEMEROBIIDÆ.

Hemerobius cockerelli n. sp.

Head pale yellowish, darker across base of clypeus; antennae pale yellowish, not banded; thorax pale yellowish, with a broad brown stripe on each side, not as plain behind as on the prothorax; abdomen pale at base, darker beyond; legs pale; fore-wings pale brown, with many white spots through the middle region, these white spots margin similar spots on the otherwise brown veins, and they are arranged in transverse series; there are a few of these spots beyond the outer gradate series. A darker brown band across both series of gradate series, and a large spot at the connection between the cubitus and post-cubitus. Hind-wings hyaline, veins brown. Around the margin of both pairs there are many brown dots, one between and one at the end of each veinlet; there are no white spots on the margin. The wings are moderately narrow, not much swollen on costa at base; three sectors, the first branch of the first connected back to radius twice; the post-cubitus bent toward the cubitus, so that the connecting veinlets are of unequal length. Male appendages with a lower and a median projection, the latter bifid at tip.

Length, 10 mm.

One specimen from top of Las Vegas range, New Mexico.

LIMNOPHILIDAE.

Asynarchus costalis n. sp.

Face yellowish; palpi yellowish, slender; vertex reddish yellow, ocelli small, posterior and anterior tubercles subequal in size; antennae long and slender, reaching beyond end of wings, yellowish on base, darker beyond, the basal joints about one-half their diameter apart, and as long as the face, the outer and inner sides each marked with a broad brown stripe; legs slender, pale yellowish, spines black, spurs 1–3–4, first tarsal joint of ♂ long, few spines on tibia I, one at tip of femur I.; thorax with a brown stripe each side. Fore-wings quite long, rounded at tip and on apical margin, the surface minutely granulate, sparsely clothed with short yellow hair, black hair near posterior margin; the basal costal area is hyaline, beyond and behind is brown, with many small pale spots; larger pale spots in bases of all apical cells except the first, a long one in base of first subapical, a spot on thyridium before the posterior anastomosis and reaching into cell, and a spot in the thyridial cell still nearer the base; veins dark brown. The first and fifth apical cells extend but little basad of the anastomosis; the discal cell is a little longer than its pedicel; the veins at posterior anastomosis are disjointed. The hind wings are hyaline, with brown veins, the fourth apical cell nearly as broad as the second, a dot in the base of the third.

Length, 13 mm.

Two specimens from top of Las Vegas range, New Mexico.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXVIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Eucrostis viridipennata Hulst.

Egg. Elliptical, disk-like, flattened concave above and below with sharp edges, one end a little more rounded pointed than the other, narrower, neither perceptibly truncate or depressed. Smooth olivaceous green, shining, with small, narrow and obscure reticulations. Size .8 × 6 × .35 mm.

Stage I. Head rounded bilobed, not shining yellowish ochraceous; width about .3 mm., ocelli black, mouth brown. Body with a subdorsal point on joint 2 anteriorly, the segment slightly collared; else smooth, cylindrical, moderately elongate, normal. Segments faintly several-annulate, the incisures not depressed. A slight rounded stigmatal elevation, most visible on joints 5, 6 and 10. Greenish white, a diffuse red-brown dorsal line, narrowed to obsolescence at the ends. Tubercles and setae very small and obscure, the latter very short, black with enlarged tips. Skin minutely shagreened granular.

Stage II. Head bilobed, the lobes produced into vertical, conical horns, flat before; yellowish, granular, ocelli black. Body cylindrical, uniform, segments not incised, finely granular; a slightly elevated dorsal line. Feet normal, the anal ones with large granular plates. Yellowish white, tinted with brown, the granules and subdorsal line whitish, the anal plates pale edged. Conical horns on joint 2 concolorous, granular. Thoracic feet appressed. No marks, no setae nor tubercles. Anal plate pointed behind.

Stage III. Head strongly conically bilobed, held obliquely forward, pale greenish yellow, granular. Body as before, the cones on joint 2 smaller than the head lobes but similar. Body green, the linear, subdorsal, whitish raised line looped up a little anteriorly on the segments. Pale whitish yellow with a diffuse brown dorsal band obsolete at the ends. Anal plate pointed; anal feet extended laterally with large plates.

Stage IV. Head granular roughened, the lobes produced into conical horns, greenish yellow, apices brown, a blackish shade on the outer side of lobes; width 1 mm. Body as before, light yellowish green with a faint and diffuse brown dorsal line, obsolete at the ends. Subdorsal raised line as before, whitish, obscure. Skin densely pale granular. The long pointed anal shield exceeds the rather high anal leg shields. A dark brown shade subventrally on joint 12. Thoracic feet faintly reddish shaded.

Stage V. Head granular, the high, erect, pointed lobes projecting as far as half the height of the head; whitish green on face, lobes and sides brown shaded, with a few blackish dots; width 1.4 mm. Body slender, green, angular at the joints when bent, the cones on joint 2 smaller and slenderer than the head lobes, but resembling them, brown shaded. Dorsum slightly yellowish between the obscure, slightly raised subdorsal lines of granules with a red-brown diffuse dorsal line. Anal plate produced into a cone behind, brownish at the sides. Thoracic feet brownish, appressed and touching the head at rest, the whole looking like one piece. A faint, pale, stigmatal shade. A dark red-brown mark subventrally on joints 12–13. Abdominal feet brownish shaded. Surface all finely pale granular. Spiracles reddish; no perceptible tubercles.

Cocoon of a few strands of silk between leaves.

Food plants. The larvae ate wild cherry, gooseberry and cottonwood but refused several herbaceous plants.

Eggs from a female taken at Boulder, Colorado, June 4th; pupation July 15th.

Another example was captured in the foothills above Golden, Col.

Distribution of Cryptocercus punctulata. — This cockroach was originally described from Virginia, Pennsylvania and New York. It has since been recorded from Tennessee (Saussure) and Kentucky (Garman). I have seen specimens from North Carolina (Coll. Am. Ent. Soc), Cumberland Gap, Ky. (Dimmock), California (Rathvon) and Oregon at Glendale and Divide or Cottage Grove (Morse). *S. H. Scudder.*

PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

PSYCHE.

THE SPECIES OF GRYLLUS FOUND IN THE UNITED STATES EAST OF THE SIERRA NEVADAS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In 1862 I recorded in New England and the region not far distant from it six species of Gryllus of which two were described as new, both from New England. These species supposed to be new have been little recognized since and may now be definitely regarded as synonyms. The results of a recent study of material from over the whole of the United States, amounting to nearly a thousand specimens, are brought forward in this and a companion paper (PSYCHE, ix, 267) on the genus Gryllus as found on the Pacific coast. Most of the species are extremely difficult to separate.

So far as I can discover, there are but three species in the northern and central United States east of the Mississippi.* Each of these, but in differing degrees, develops both macropterous and brachypterous forms and may be separated by the following table:—

a^1. Black species, the tegmina and parts of the body sometimes testaceous; first joint of antennae not projecting beyond the front of the head.

b^1. Larger, more frequently with testaceous tegmina, the male relatively stouter with larger and broader head, the female with ovipositor nearly, quite, or more than, half as long again as hind femora . . . . *abbreviatus* Serv.

b^2. Smaller, more frequently black throughout, the male relatively slenderer with narrower and less tumid head, the female with ovipositor rarely more than one fourth as long again as hind femora. . . . *pennsylvanicus* Burm.

a^2. Straw-colored with light fuscous markings; first joint of antennae projecting slightly beyond front of head. . . . . . . *domesticus* Linn.

The separation of the first two species is a difficult task, and I have been unable in all cases to place specimens, especially of the male sex. The characteristics given in the table have therefore of necessity been stated in a rather general form. *G. abbreviatus* has for synonyms *G. luctuosus* Serv., *G. angustus*

* Excepting that a single example of a southern species described further on has been taken in Indiana.

Scudd., *G. signatipes* Walk., and *G. scudderianus* Sauss. It is widely spread, only less widely than the next species. In this paper I take account only of specimens at hand for study without regard to literature. I have seen specimens from New Hampshire: White Mt. valleys, Mt. Washington (Slosson);—Massachusetts: vicinity of Boston, Sherborn (Morse), Wellesley (Morse), Cape Cod (Sanborn), Provincetown (Morse), Nantucket;—Connecticut: South Kent, Canaan, and New Haven (Morse);—Rhode Island: Block Island (Morse); —New York: Ithaca (Morse);—Pennsylvania: Harrisburg (Shurtleff);—Maryland (Uhler);—Indiana (Blatchley);—Ohio: Olive (Higginson);—Illinois: Green River (McNeill), southern Illinois (Kennicott);—Lake Superior (Uhler);—Manitoba: Red River (Kennicott); — Minnesota; — Iowa: Denison (Allen), Dallas Co. (Allen);—Nebraska: Platte River (Hayden), Nebraska City (Hayden), Loup Fork, Pawnee Reserve (Hayden);—North Carolina (Shute, Ordway);—Georgia (Morrison, Oemler, Gerhard);—Florida: Fernandina (Palmer), Lake Okeechobee (Palmer), Sanford (Frazer, Comstock), Pilatka, Appalachicola (Thaxter), Ft. Reed (Comstock); Charlotte Harbor (Slosson), Capron (Comstock), Key West (Palmer);—Alabama: Utaw;—Louisiana: Milliken's Bend (Shurtleff), New Orleans (Akhurst);—Texas (Belfrage), Pecos River (Pope). Both macropterous and brachypterous forms occur in nearly every district, and in nearly all of them the brachypterous forms largely prevail, the macropterous being apparently nowhere uncommon.

G. pennsylvanicus has for synonyms *A. nigra* Harr. and *G. neglectus* Scudd. It is our most widespread species, crossing the continent in the north and extending south to the limits of the United States at least west of the Mississippi. I have specimens before me from Maine: Norway (Smith), Fryeburg (Morse);—New Hampshire: Hanover (Weed), Holderness (Morse), Kearsarge Village (Morse), White Mt. valleys, Franconia (Slosson);—Massachusetts: Adams, Reading, Dover, Wellesley, Sherborn, Winchendon, Blue Hills, Medfield, Natick, and Nantucket (Morse), Cambridge, Provincetown, Cape Cod;—Rhode Island: Block Isl. (Uhler);—Connecticut: Stamford, Canaan, and South Kent (Morse); New York: Albany, West Farms (Akhurst), Ithaca (Morse), Chateauguay (Bowditch);—Maryland (Uhler);—Michigan: Detroit (Gillman);—Illinois: Port Byron (McNeill), Chicago, Rock Island (McNeill), southern Illinois (Kennicott, Thomas);—Missouri: St. Louis (Engelmann);—Kansas: Lakin (Scudder);—Nebraska: Platte River (Hayden);—Iowa: Dallas Co., Crawford Co., Denison, and Jefferson (Allen);—Colorado: Ft. Collins (Baker), Denver, Grenada, and Pueblo (Scudder), 5500′ (Morrison);—Utah: Parowan (Palmer), Mt. Trumbull (Palmer), near Beaver (Palmer), Salt Lake (Scudder);—Montana: expl. of upper Missouri (Hayden), Muscle Shell River (Hitz), N. Pac. R. R. Surv. (Suckley), N. W. Boundary Survey (Kennerley);— British Columbia, Washington, Oregon, and California (the details given in another paper);— New Mexico: Ft. Buchanan (Nevin), Santa Fé (Cockerell), Mesilla Park (Cockerell), Las Vegas (Cockerell);— Texas: Goliad (Palmer), Pecos River (Pope), San Antonio (Palmer), Corpus Christi Bay (Palmer), Ringgold Barracks (Schott). Macropterous specimens are very rare in this species, and have been seen by me only from Massachusetts, Missouri, and Colorado.

G. domesticus is before me in specimens from New York: West Farms (Akhurst);— southern Illinois (Uhler);— Carolina (Schaum);— Georgia: Rosswell (King);—Alabama: Utaw;— and Texas (Belfrage). All that I have seen are macropterous, but brachypterous specimens occur in the Old World.

West of the Mississippi and north of Utah, *G. abbreviatus* and *G. pennsylvanicus* (and especially the latter) seem to be the only species known. In Kansas, however, another species, *G. personatus* Uhl., appears, which also extends to Colorado and Texas. It may be distinguished from these species by having the genae of the head and the lateral lobes of the pronotum luteous or testaceous instead of black. I have seen specimens from Kansas (Uhler), between Ft. Kearny and Ft. Laramie (Suckley);— Colorado: Ft. Collins (Baker in Morse's coll.);— Texas: San Antonio (Palmer), Eagle Pass (Schott), Pecos River (Pope). Both macropterous and brachypterous forms occur, the latter appearing to prevail.

In the southern Rocky Mountain region (Colorado, Utah, New Mexico and Arizona) four species are found, one of them new and described below. They may be separated by the following table:

a[1]. Genae and lateral lobes of pronotum light colored. . . *personatus* Uhl.
a[2]. Genae and whole pronotum black.
  b[1]. Whole body black, the tegmina sometimes nigro-testaceous; 5–6 spines on outer side of hind tibiae.
    c[1]. Pronotum nearly twice as broad as long. . . . *integer* Scudd.
    c[2]. Pronotum about half as broad again as long. . *pennsylvanicus* Burm.
  b[2]. Tegmina and legs testaceous; 7–8 spines on outer side of hind tibiae *armatus* sp. nov.

The distribution of *G. personatus* has just been given, and that of *G. pennsylvanicus* in an earlier part of this paper in detail. *G. integer* was described and its distribution given in my paper on the species of Gryllus on the Pacific coast. A description of the species regarded as new follows.

Gryllus armatus sp. nov. — Small and rather slender with piceous body. Head scarcely or not wider than the pronotum, gently tumid, the vertex not very prominent, the whole head black. Pronotum rather more than half as broad again as long, equal, with nearly parallel sides, feebly villous, black throughout except for a delicate ferruginous margination in front, the front margin truncate, the hind margin faintly convex, with a median impressed line fading on posterior third, the lower margin of lateral lobes gently and obliquely convex. Tegmina covering (♂) or nearly covering (♀) the abdomen, testaceous, the mediastinal vein with from two to four branches, the post-specular area of male tegmina rather large; wings usually not surpassing the tegmina but sometimes caudate. Legs testaceous, the hind femora not very stout, the hind tibiae with seven or eight spines on the outer side, the upper inner calcar scarcely shorter than the intermediate calcar. Ovipositor a little longer than the hind femora.

Length of body, ♂, 17.5 mm., ♀, 17 mm.; pronotum, ♂ ♀, 3.25 mm.; breadth of same, ♂, 5.25 mm., ♀, 5 mm.; length of tegmina, ♂, 10.5 mm., ♀, 9 mm.; hind femora, ♂ ♀, 11 mm.; ovipositor, 13 mm.

6 ♂, 1 ♀; Beaver Dam, Utah, April (Palmer); Ehrenberg, Ariz. (Palmer); Ft. Whipple, Ariz. (Palmer).

About a third of the specimens seen are macropterous.

There remain the species of the southern United States east of the Rocky Mts. These may be separated by the following table:—

a ¹. Pronotum wholly black.
- *b*. Pronotum about half as broad again as long.
  - *c* ¹. Very large species, about 25 mm. long, with convex hind margin to the pronotum, and 7–8 spines on hind tibiae . . . . *firmus* sp. nov
  - *c* ². Medium or small sized species, not often exceeding 20 mm. long, with nearly truncate or faintly angulate hind margin to the pronotum and 5–6 spines on hind tibiae . . . . . *abbreviatus* Serv., *pennsylvanicus* Burm.
- *b* ². Pronotum nearly twice as broad again as long. . . *integer* Scudd.

a ². Pronotum prevailingly light or with light markings.
- *b* ¹. Wholly testaceous, more or less marked with fuscous; first joint of antennae projecting slightly beyond front of head. . . . . . *domesticus* Linn.
- *b* ². Prevailingly dark; first joint of antennae not projecting beyond front of head.
  - *c* ¹. Head except vertex testaceous; hind tibiae relatively short, with 5–6 spines on margins. . . . . *personatus* Uhl.
  - *c* ². Head wholly black; hind tibiae relatively long, with 7–8 spines on margins . . . . *rubens* sp. nov.

G. assimilis Fabr. is not included in this table, as I have seen United States specimens only from California, but it is reported to occur in the Gulf States. The distribution of all the species of the table excepting the first and the last has already been given or referred to. The two remaining species may now be described.

Gryllus firmus sp. nov. — Large and stout, with piceous body. Head large, tumid, with prominent vertex, scarcely broader than the pronotum, wholly black. Pronotum stout, black, most delicately margined anteriorly with ferruginous, broadest in advance of the middle, the sides being slightly and not quite uniformly convex, half as broad again as long, the front margin with scarcely perceptible concavity, the hind margin slightly but distinctly and broadly convex, with a median impressed line scarcely or not visible on posterior third, the lower margin of the lateral lobes oblique and nearly straight. Tegmina nearly or quite covering the abdomen, testaceous more or less infuscated, often in the female leaving a clear testaceous humeral stripe, the mediastinal vein with three or four branches; wings generally no longer than the body, but sometimes caudate in the female. Legs ferruginous or testaceo-ferruginous, often more or less infuscated, the hind femora stout, the hind tibiae with generally six or seven rather long spines on the outer side, the upper inner calcar very long and almost as long as the intermediate calcar. Ovipositor fully a third longer than the hind femora.

Length of body, ♂, 27 mm., ♀, 26 mm.; pronotum, ♂, 5 mm., ♀, 5.5 mm.; breadth of same, ♂ ♀, 7.5 mm.; length of tegmina, ♂ ♀, 14.5 mm.; hind femora, ♂, 16 mm., ♀, 16.75 mm.; ovipositor, 23.5 mm.

6 ♂, 7 ♀. Brookville, Ind. (Dr. Rufus Hayward); Smithville, N. C., Nov. 22; Dingo Bluff, N. C., Nov. 15 (Parker and Maynard); Georgia (Oemler, Gerhardt); Sandford, Fla. (G. B. Frazer); Key West (Morrison). I have also specimens from Texas.

This is the largest United States species known to me. About a third of the specimens seen are macropterous.

Gryllus rubens sp. nov. — Rather large and somewhat slender, the body piceous with rufous and rufo-testaceous markings. Head large, full, the vertex rather prominent, slightly wider than the pronotum, the whole head piceous. Pronotum about half as broad again as long, subequal with scarcely convex sides, feebly villous, piceous, the front and hind borders very narrowly margined with rufo-testaceous, the lateral lobes broadly striped above (at place of lateral carinae) and down the front with rufo-testaceous, the front margin of disk very faintly angulato-emarginate, the hind margin very faintly bisinuate, the lower margin of lateral lobes gently and obliquely convex and broadly and feebly marginate. Tegmina covering the abdomen, testaceous, faintly infumated, the mediastinal vein with three branches; wings in only specimen seen not surpassing the tegmina. Legs rufous slightly tinged with testaceous and more or less infuscated, the hind femora moderately stout, the hind tibiae with six rather long spines on the inner, seven on the outer margin, the upper inner calcar nearly as long as the intermediate calcar. Ovipositor about a fourth longer than hind femora.

Length of body, 20 mm.; pronotum, 3.75 mm.; breadth of same, 6 mm.; length of tegmina, 12 mm.; hind femora, 13 mm.; ovipositor, 16 mm.

1 ♀. Auburn, Alabama (Baker, in Morse coll.).

A word may be added concerning wing-length. Of the ten species of Gryllus recognized in this and my complementary paper, all but two appear in both the forms, macropterous and brachypterous; and of these two one, *G. rubens*, is known only by a single specimen, and the other, *G. domesticus*, is known to occur in both forms in Europe, though here I have seen only macropterous. The caudate condition is extremely rare in *G. pennsylvanicus*, common in *G. abbreviatus*, is found in 4 out of the 5 specimens seen of *G. assimilis*, 5 out of 9 of *G. personatus*, 27 out of 31 (and so nearly universal) in *G. integer*, 1 out of 9 in *G. vocalis*, 2 out of 7 in *G. armatus*, and 6 out of 16 in *G. firmus*. In general it appears to be rather more common in females than in males.

The crickets retreat, figured in Harper's Magazine, Vol. 93, p. 693, in probably that of *G. abbreviatus*.

A NEW SPECIES OF THE GENUS SAISSETIA (COCCIDAE).

With notes on some of the species of the genus not well understood.

BY GEORGE B. KING, LAWRENCE, MASS.

Saissetia nigrella n. sp.

♀ Scale black 3 mm. long, 2½ wide, 2 high very convex, shiny surface smooth marginally carinated, texture thick. Of the 20 specimens examined all showed and 8 segmentes antenna; variable however, as follows :

Segment 1–2–3–4–5–6–7–8 in μ
46–44–48–40–44–24–24–52
46–48–60–48–40–24–24–52
46–48–52–36–40–24–24–52
44–44–48–40–44–24–24–52

Hind leg: coxa 100; femur with trochanter 160; tibia 104; tarsus 80. Marginal spines, club-shaped with split tips 36 × 24 μ long. Digitules of claw 24 μ long with large dilated end. The derm is yellowish brown with irregular oval gland orifices, no irregular plates forming a marquetry pattern as in S. depressa and S. nigra, but the skin seems to be without tessellation.

Hab. — On Ficus sp. at Tongaar, Natal, South Africa (Fuller No. 7).

The above species were sent to Prof. Cockerell by Mr. Fuller with several other species of Coccidae. Being the only species of Saissetia sent, Prof. Cockerell turned it over to me for study. I wish to say however that it is a very hard species to clear for study, owing to its thick tough skin, which resists the action of caustic potash after prolonged boiling. Superficially it resembles *S. nigra* but differs from that species by being very much smaller, structurally by the derm not having the marquetry pattern with oval gland pits enclosed.

Saissetia nigra.

Lecanium nigrum Nietner 1861.

Saissetia depressa.

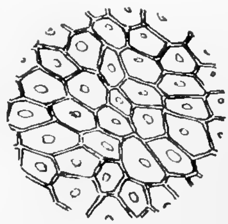
Lecanium depressum Targioni 1867.

The above two species seem to be decidedly mixed, both being considered by some coccidologists as one species, while others believe depressa to be a variety of nigra. Mr. Maskell, Trans. N. Z. Inst. 1893, believed *nigra*, *depressa* and *begoniae* (I have not seen *begoniae*) to be identical. The confusion seems to have arisen from the extremely close resemblance of the polygonal glands of the derm in each of the species, and from not properly studying the scales superficially as in them are found characters which are certainly specific. Furthermore it appears, and the more I read the literature upon the species the more I am convinced, that in most cases the scales sent to the specialists were *nigra* and not *depressa* as supposed by the sender. The writer has had *nigra* sent him for *depressa* and vice versa; of course Dr. Howard and *S. nigra* from Mr. Pergande. The destinctive character of each species is as follows.

S. nigra. ♀ Scale very dark brown, approaching black. The entire outer margin carinate, distinctly so anteriorly and posteriorly, marginally not so pronounced. Texture very thick, shiny, smooth. Elongate oval 4 mm. long, 3 broad, 2 high.

S. depressa. ♀ Scale, deep red brown, not at all blackish, somewhat shiny. General outline oval, flat, much narrower in front than behind. Surface rugose, pitted and the margin distinctly ribbed; about the center of the dorsum posteriorly is a slight but distinct

Saissetia nigra.



Saissetia depressa.

Markings of the derm.

this was misidentification where proper study was not made. Recently I received *nigra* on *Anona reticulata* from Grenada, W. I., and a species on Coleus at Barbadoes, W. I., marked new var., of *nigra*, collected and kindly sent to me by Mr. H. Maxwell Lefroy, the imperial entomologist; he says the same variety is found on wild Agave. The supposed variety is clearly *S. depressa.* I have also perfect examples of *S. depressa*, on wild "*Almond*" (*Terminalia*) from San Juan, Porto Rico, collected by Mr. Busck, U. S. Dept. of Agriculture, kindly sent to me through depression. Marginal carina nearly obsolete. Texture of the scale decidedly thinner than in *S. nigra.* Size 3 mm. long, 2½ broad, 1 high. As to the microscopical characters, there are slight differences. The derm of *depressa* is more transparent. The lines forming the polygonal structure in *depressa* are narrower more sharpened edges. In *nigra* they seem to be thicker and flattened. The antennae of each are similar and quite difficult to measure correctly owing to the markings of the skin.

SAISSETIA HEMISPHAERICA.

Lecanium hemisphaericum Targ.-Tozz. 1867.

The ♀ scale is smooth elongate oval 4½ to 5 mm. long; 2 to 3 broad, and 2 high. Color variable, reddish brown, yellowish brown to a tinge of greenish brown, rounded dorsally without ridges forming an H though this character is found in the immature individuals. Antennae 8-jointed measuring in µ joint 1(56), 2(60), 3(84), 4(52) 6(36) 7(28) 8(56), joint 1 has one hair, 2, two; 3, three; 4 three; 5 two; 6 one; 7 two and 8 eight. Front leg: coxa 120 long; femur with trochanter 240; tibia 168; tarsus 88. Tarsal digitule 56 long. The outer margin of the skin after treatment with potash is much darker than the rest, and the entire surface tessellated, and thickly covered with oval gland orifices.

SAISSETIA FILICUM.

Lecanium filicum Boisd. 1868.

♀ Scale yellowish red brown to red brown, practically hemispherical, though some examples found at the ends of the small twigs and leaves of the food plants are somewhat elongate. The adult ♀ scale and young having one longitudinal and two transverse ridges forming a raised H marginally distinctly keeled. The longitudinal ridge has 4 minute raised round tubercles, and the entire scale more or less minutely pitted, surface somewhat shiny. Size 3 mm. in diameter and 2 mm. high.

Antennae 8-jointed in µ long 1(52) 2(48) 3(56) 4(44) 5(20) 6(24) 7(28) 8(40). Front leg: coxa 120; femur with trochanter 200; tibia 152; tarsus 88. The skin marginally dark ocherous thickly covered with large oval gland orifices. The center and large portion of the skin colorless with the gland pits very indistinct.

It seems to the writer that the names of the above two species are misplaced. *S. filicum* should be called *S. hemisphaerica* and the latter *S. filicum*, owing to the fact of *S. filicum* as it now stands is a hemispherical shaped species, while *S. hemisphaerica* is an elongate oval one. Indeed it seems as though *S. filicum* was the one originally described as *L. hemisphaericum*. The marginal hairs of the four above species are all very similar with expanded ends which are more or less split interspersed with ordinary sharp spines without expanded ends or split. The lateral incisions of all are also of the same shape similar to a half oval.

Saissetia hemisphaerica was received from Prof. Cockerell, collected by him Aug., 1901, at La Galla, San Diego county, Calif., on pepper tree (*Schinus molle*), on *Cycas circinalis*, Trinidad (West Indies) from Dr. L. Reh, and on fern in greenhouses in Mass. Those of *S. filicum* were from ferns in greenhouses, Lawrence, Mass. collected by myself.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXIX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Epelis truncataria Walker.

Egg. Elliptical, strongly flattened-concave, one end neatly truncate, the other slightly depressed; shining pinkish gray, slightly iridescent. Reticulations strong, sharp, regularly hexagonal, resembling honey-comb at the truncate end, arranged in nearly regular longitudinal rows for two-thirds the length, confused into normal reticulations at the depressed third; pits rather deep, well-marked. Length .7, width .5, height about .3 mm.

Stage I. Head rounded, erect, pale, yellowish, the sutures faintly and mouth brown, ocelli black. Body normal, short and thick, yellowish with distinct green tint and fine, discreet, purple brown lines, about as wide as the intervening spaces, dorsal (distinct on the cervical shield), subdorsal, lateral, stigmatal and fainter subventral ones. Shields all concolorous; tubercles obscure; setae short, stiff, black, enlarged at tips. Feet normal, pale. Shields faintly lined.

Stage II. Head round, erect, free, greenish luteous, mouth brown, eye black; smooth, shining; width .5 mm. Body normal, moderate, smooth, green with dorsal, subdorsal and lateral pulverulent, subgeminate, blackish bands and a single suprastigmatal one; subventral fold pale. Tubercles elevated, concolorous; setae short, dark, capitate. Shields undifferentiated. Thoracic feet faintly reddish, abdominal ones green. Subventral and ventral lines more dotted and broken, geminate, blackish.

Stage III. Head round, erect, broad, flat before, vertex slightly under joint 2; pale green, faintly brown shaded on the sides above the black ocelli; width .9 mm. Body robust, moderate, uniform, incisures not depressed, segments not elongate. Whitish green, opaque; addorsal, subdorsal, lateral geminate crinkly blackish lines, darker green filled, uniform over the cervical shield but replaced by yellowish green on the anal plate; a single suprastigmatal line; subventer and venter yellowish green with two subventral and a single ventral greenish black lines. Tubercles black, minute; setae short. Feet pale, the abdominal ones very faintly lined.

Stage IV. Head rounded, erect, free; all leaf green; clypeus rather high, ocelli black; width 1.3 mm. Body rather short, as before. Green with the narrow blackish, double, pale-filled lines as before but both dorsally and ventrally practically alike. Subventral fold whitish. Feet green, the anal ones with triangular shields like the anal plate. No cervical shield. Tubercles small, concolorous, with short, pointed black setae. The lines are addorsal, subdorsal and lateral (substigmatal-subventral fold, not dark edged), subventral and adventral, all geminate, pale, almost whitish filled. Later the color pales and the lines look whitish with dark green edges. Subventral fold white; dorsal incisures folded, yellowish white. A short, robust larva, uniform, the segments not elongate.

Food plant, bearberry (*Arctostaphylos uva ursi*).

Eggs from a female taken on the summit of the foothills back of Golden, Colorado (Chimney Gulch).

THE HATCHING OF EACLES IMPERIALIS.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

Eggs of *Eacles imperialis* had a red line part of the way around the edge of each. As the larva developed this line became broken, and, on the day before hatching, showed the red dashes to be the dorsal tubercles of the larva. This could be seen without a lens, but a fifteen-diameters glass showed also the setae at the top of each tubercle, those on the four tubercles over the head being black, the others white. When the larva hatched the red raised dots — for they were not more than that — began to grow at once, the red color remaining in the tip of each, and the lower part having almost no color at first. The growth was so rapid that in five minutes after leaving the shells the long thoracic tubercles or "horns" had their normal size and shape, and the lateral spines had appeared. The setae grew dark first, then the spines, then a pale red color suffused the "horn" as if it ran down from the tip, which grew paler.

The abdominal tubercles gained the normal color first, in about fifteen minutes, and in an hour all the tubercles, spines, feet, tips of props, and mouthparts had become black.

The development of the long tubercles was very rapid and very interesting, and was watched in many instances, each one giving exactly the same details in the same order, though the caterpillars differed much in the time they took to eat their way out of the shell. Some needing an hour, others over two hours.

Observation of another set of eggs showed that the color of the thoracic setae varied, some larvae having the setae all black before hatching, others having only those of the first segment black, the others being white.

Literature.— Comstock and Kellogg's Elements of Insect Anatomy, advertised on another page, is an admirable guide to the practical study of the anatomy of insects. The subjects treated in detail are the external anatomy of Melanoplus and Pterostichus, the internal anatomy of Corydalis and the general anatomy of the larva of Holorusia. Chapters explanatory of technical terms, of the mouthparts and venation and of methods of insect histology add everything that is requisite for the beginner. We cordially commend the work.

Correction: — Page 273, col. 2, line 1, for *Odynerus* read *Eumenes*.

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SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.—VII.

COLEOPTERA.

BY H. C. FALL.

The following species, additional to the former list, were taken on the top of the Las Vegas range in 1901.

Nebria sahlbergi Fisch. The most widely distributed species of the genus, occurring from Labrador to Sitka and the Kenai Peninsula. Within the United States it is recorded from the White Mts. of New Hampshire, Michigan, Lake Superior, Washington and Oregon. It is probable that in the latitude of New Mexico this species will be found only on the summits of the highest ranges.

Bembidium dyschirinum Lec. North Pacific Coast, Montana, Colorado (Breckenridge and Leadville — 9500–10000 ft.— Wickham).

Discoderus parallelus Hald. "Most common in Texas and New Mexico" (Horn), also known from Pennsylvania, Georgia, Iowa, and Kansas.

Coccinella transversoguttata Fab. A common and extremely widespread species, ranging from Massachusetts north to Hudson Bay and Greenland, across the Continent to Alaska, and south to California, extending also along the Rocky Mts. into Mexico. In Eurasia it is reported from Siberia, Japan, Northern China, Dauria and Lapland.

Coccinella 9-notata Herbst. New England, New Jersey, Canada, entire Rocky Mt. region, California, Mexico, Guatemala.

Podabrus lateralis Lec. Colorado and New Mexico, at high or moderately high elevations.

Pachyta liturata Kby. Hamilton gives the range of this species as follows. "Bay of Kenai (Alaska), Stikine River B. C., Vancouver to Canada, and Northward to Hudson Bay; Michigan, Vermont, Washington, Idaho to New Mexico."

Acmaeops pratensis Laich. Maine to Alaska; Rocky Mts. to New Mexico; Sierra Nevada Mts.; Siberia, Northern China, Alpine and Northern Europe.

Leptura aspera Lec. Canada, Michigan, Colorado, Idaho, Vancouver.

Orsodachna atra Ahr. New England to Vancouver and northward, and southward in the more elevated regions to North Carolina, New Mexico, Arizona and California.

Stephanocleonus plumbeus Lec. Described from New Mexico but specimens taken on the north shore of Lake Superior are said by Leconte to be identical.

[*Dendroctonus piceaperda* var. *engelmanni* Hopkins, MS. Determined by Prof. Hopkins. It is the form of the species which lives on *Picea engelmanni* in Colorado, and, as we now see, in New Mexico. — T. D. A. C.]

A NOTE ON THE SECONDARY SEXUAL CHARACTERS OF OMOPHRON.

BY ROLAND HAYWARD, BOSTON, MASS.

While recently engaged in studying some specimens of *Omophron americanum*, my attention was attracted to the fact that in the males of this species the second joint of the middle tarsi is very distinctly dilated. The fact being new to me I was led to examine our other species in order to ascertain whether or not the character was common to all those occurring within our faunal limits. As a result I find that the North American species may be divided into two groups based upon this character. In the first the ~~second~~ joint of the middle tarsi is dilated; in the second it is simple as in the female. To the first may be referred the majority of our species, i. e.: *labiatum*, *nitidum*, *obliteratum*, *dentatum*, *americanum*, *tessellatum*, and *ovale*, while but two of those that I have been able to study, i. e.: *gilæ* and *robustum*, are referable to the second. Casey's species, *concinnum*, *solidum*, and *gemma* are unknown to me in nature.

The extent of dilation varies somewhat in the different species, being most marked in *nitidum* and apparently feeblest in *tessellatum*.

I have searched the books in vain for any mention of this character. All agree in stating that the first two joints of the anterior tarsi are dilated in the males, but I can find no reference to the middle tarsi of that sex differing from those of the female. It is not uncommon for this character to occur in certain groups of the subfamily *Harpalinæ*, but I am not aware of its existence elsewhere in the *Carabinæ*.

A PRELIMINARY SKETCH OF THE SPHINGICAMPIDAE, A NEW GROUP OF PROTOSPHINGINE LEPIDOPTERA, WITH ITS SUBDIVISIONS. — I.

BY A. S. PACKARD, PROVIDENCE, R. I.

After prolonged studies on a number of genera heretofore associated with the Saturniidae, I have come to the conclusion, as indicated in PSYCHE, Dec., 1901, p. 279, that they should be removed from that family and placed in a new family, or superfamily, group, which we may designate *Sphingicampidae*, from the most ancestral and typical genus, Sphingicampa. I should prefer to give the name of Protosphingina to the group, for recent prolonged examination of the larval, pupal and adult characters enable me to confirm the idea suggested by several others besides myself, that the Sphingidae have almost directly descended from the Citheroniinae (Ceratocampidae). The group also appears to have given origin to the Hemileucidae.

The Sphingicampidae may be thus briefly defined: Body often Sphinx-like; antennae usually bipectinate, the tip more or less filiform; maxillae usually present, but small and weak; in some genera (Anisota, etc.) absent. The wings either small, narrow, Sphinx-like, or broad, large and saturniid in shape. Eleven veins in the fore wings, and in the hind wings eight (nine, invariably, in the Citheroniinæ). Discal cell usually small, invariably closed by the discal veins. The last subcostal vein, or vein III_2, often so detached as to form an "independent" vein.

Larva with stout spines (instead of the soft spiniferous tubercles of Saturniidae); larva sometimes smooth-bodied in the last stage, the median spine on 8th abdominal segment always double. Anal legs very large; the typical and ancestral forms strikingly sphinx-like. Pupa with a large spine-like cremaster; subterranean, or situated under leaves on the surface, a few species spinning a slight thin cocoon, as occurs in some cases in the Sphingidae.

The group is, in accordance with our present knowledge, divided into six subdivisions which are either families or subfamilies or categories approximately of that rank. We will for the present call them subfamilies.

These groups of Protosphingina may provisionally be thus defined.

1. *Citheroniinae*, with the characters of the group formerly named Ceratocampidae. Fore wings with eleven veins, hind wings with nine veins. The typical larval forms with long large thoracic and abdominal spines and the suranal plate tuberculated. Pupa subterranean, with a large cremaster. Sphingicampa, Syssphinx, Anisota, Eacles, Citheronia.

2. *Agliinae*. Head tending to be unusually narrow between the eyes; antennae bipectinated. Palpi large, 3–jointed; maxillae unusually well developed (in Aglia absent). Wings moderate, or very large, sometimes tailed. Vein III_2 more or less detached and forming an independent vein. Discal cell very small. Larva in its last stage spineless, smooth; in the early stages with 2–6 thoracic spines, and a median double spine on 8th abdominal segment. Pupa like that of Eacles. Arsenura, Rhescyntis, Dysdaemonia, Bathyphlebia, Aglia, Polythysana, Cercophana, Eudelia.

3. *Urotinae*. Antennae of ♂ with but a single pair of pectinations to a joint; vein III_2 independent; hind wings tailed. Larva in the last stage smooth, without spines. Urota.

This is a provisional group. Eudelia closely approaches Cercophana and the two approach Aglia on the one hand and Urota on the other. The venation of the fore wings is much as in Aglia, and the genera may have to be merged in with the Agliinae.

4. *Bunaeinae.* Antennae bipectinate, tip filiform, or pectinated to the tip. Vein III_2 is never detached so as to form an independent vein. Wings usually very large, and in the more specialized genera closely approaching the Saturnian Antheraea (a case of parallelism or convergence), but the larvae are entirely different, not spinning a dense cocoon and being armed with stout long spines (in certain genera spinulated), instead of soft tubercles crowned with several small short spines. Pupa like that of Eacles in type, ending in a large spine-like cremaster, and subterranean. Usta, Cirina, Imbrasia, Thyella, Bunaea, Antherina, Nudaurelia, Gynanisa, Lobobunaea, Salassa.

5. *Cyrtogoniinae.* Antennae of ♂ with a single pair of pectinations to a joint, in venation differing from that of the other groups, in veins II_1, II_2 and II_4 of the fore wings all originating at nearly the same point, quite far beyond the outer end of the discal cell. This is an entirely provisional group (perhaps an offshoot from the Bunaeinae) as my material is imperfect, and we know nothing of the transformations of the single genus Cyrtogone.

6. *Eudaemoniinae.* An aberrant group not improbably of full family rank, perhaps belonging here, or near Urotinae. The single genus is remarkable for the excessively long tails of the hind wings, the long slender palpi, the end of the second joint extending just beyond the front, and the third joint very long; and the venation. Head in front squarish; when denuded of scales flat, scarcely narrowing in front. Antennae of ♂ with but a single pair of pectinations to each joint. Maxillae very slender, not united, but nearly half as long as the palpi. Fore wings short and broad. Hind wings small, triangular, the tail being from three (♀) to five times (♂) longer than the main portion of the wing. Venation approaching that of Urota; 10 veins in the fore wings, only 7 in the hind ones. The venation of the wings of the hinder pair is evidently affected by the great development of the "tail," which is strengthened by the three veins (III_3, IV_1, IV_2), no vein V (internal) detected. The discal veins ("discocellulars") very unlike that of Urota or any other genus, and together forming a very oblique, bent or angulated line. The body is slender; the legs long and slender; the fore-tibial epiphysis rather long and about two-thirds as long as the tibia itself; the abdomen slender, that of the ♀ clothed at the end with a large singular mop-like moss of dense, short battledoor-like scales, with a lateral tuft on each side.

The ♂ genitalia show some remarkable features which we have not met with in this or allied families. While the claspers are in the main like those of Sphingicampa, etc., the suranal plate differs in shape and armature, being small and short, with a basal pair of small spines, and a second much longer pair directed backward and arising from the middle division of the plate. The penis is curved downward, armed with two sharp teeth, hollow beneath; below it arise two sharp slender accessory spines.

The beautiful brown or delicate pink tints, and the unusual multiplicity of ring-like discal and peridiscal spots, add to the bizarre nature of this form.

Larva spiny. "The larvae feed gregariously and are of a brownish green with black spines. The eggs are laid on the young green stems at the top of the tree (*Dialium guineense*), and the pupae are found under the food-tree, lying on the surface beneath leaves." *

Beutenmüller describes the larva as being armed with black spines along the back and sides on "1, 2, 3, 11 and 12 segments." Remaining rows of spines yellow (green) tipped with black, with the spinules also tipped with black." (Journ. N. Y. Ent. Soc., v. p. 166, 1897).

From his description we judge that the larva is armed with spinulated spines, hence it does not belong with the *Urotinae*, the larva of Urota being smooth-bodied in its final stage. It appears to be nearer to the *Bunaeinae*, whose larvae in some cases have spinulated spines, and perhaps the group has arisen from that phylum.

* From a letter from Mr. A. J. Clements, Sierra Leone, Africa, to Mr. William Schaus, published by W. Beutenmüller in Journ. N. Y. Entomological Society, ix., p, 194, 1901.

TWO NEW SPECIES OF OPHION.

BY E. P. FELT, ALBANY, N. Y.

The members of this genus are extremely difficult to characterize in an entirely satisfactory manner and the descriptions of these two forms have remained unpublished for several years on this account.

Ophion (*Eniscopilus*) *arcuatum* sp. nov.— Light fulvo-ferruginous, the larger opaque chitinous spot of the cubito-discoidal cell with a distinct arcuate continuation extending along the hinder margin of the glabrous area and partly around the smaller chitinous spot.

Head medium, yellowish posteriorly, face yellowish, antennae slightly longer than the body; ocelli black, equidistant; mandibles bidentate, fuscus apically. Thorax, sericeous; meso-thorax, convex; scutellum and post-scutellum, prominent, the former yellowish; meta-thorax, slightly depressed in front of the transverse carina; lateral carinae distinct. Wings hyaline, having hardly a trace of the fuscus visible in *Ophion* (*Eniscopilus*) *purgatum* Say; marginal nervure slightly thickened and sinuate near the small stigma; cubito-discoidal nervure, weakly sinuate, not appendiculate; its bulla ½ the width of the third discoidal cell from its apex; two sub-triangular opaque spots in the glabrous area of the cubito-discoidal cell, the larger one with a chitinous, usually yellowish continuation along the hinder margin of the glabrous area to a point beyond the smaller chitinous spot, which latter is anterior and lateral of the center of the glabrous area. Legs, honey yellow. Abdomen, strongly compressed, slightly darker at the tip, the first and second segments being very slender. The claspers of the male are rounded apically.

Length about 23 mm. Wing spread from 30 to 35 mm.

Habitat, Albany, N. Y. May 6, 1876 (W. M. Hill). Ithaca, N. Y., July 16, 1889 (J. M. Stedman). South Britain, Conn. 1884 (G. F. Pierce).

There are examples of this species from Cambridge, Mass., in the collection of the Museum of Comparative Zoology and from Georgia and New Hampshire in the collection of the Academy of Natural Sciences of Philadelphia. Types will be deposited in the New York State Museum and also at Cornell University.

Ophion (Eniscopilus) appendiculatum sp. nov.— Light fulvo-ferruginous, larger opaque spot of the cubito-discoidal cell with a small extension on its posterior angle. The smaller chitinous spot is nearly circular, light yellow in color and slightly posterior to the center of the glabrous area.

This species differs in addition to the above characteristics from the preceding one in having the cubito-discoidal nervure slightly angled and not sinuate. It is a smaller form, having a length of 18 mm. and a wing spread of about 27 mm. This species is probably an inhabitant of New Jersey, as it came into my possession through the kindness of Dr. J. B. Smith. The type is deposited in the New York State Museum.

ON THE UNITED STATES ORTHOPTERA WHICH HAVE BEEN REFERRED TO THE GENUS TRIDACTYLUS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

An examination of nearly three hundred specimens widely distributed over the United States leads me to believe that of the ten nominal species of Tridactylus which have been accredited to this country, only three names can be retained: *apicalis* Say, *terminalis* Uhl., and *minutus* Scudd. To *apicalis* belong I believe as synonyms tibialis Guér., mixtus Hald., and probably illinoiensis Thom.; to *terminalis*, fissipes Sauss. and incertus Sauss.; to *minutus*, histrio Sauss., and histrionicus Sauss. The discovery by Mr. A. P. Morse of the variation in the fore tibiae of the male at once threw doubt upon the validity of several nominal species and I can see no good reason for retaining them.

There is considerable difference, as will be shown below, and as Saussure has pointed out, between the smallest of our species and the larger forms, and on this account Saussure has applied the name of Heteropus to this division, which I am inclined to regard as of generic value. The name Heteropus, given to an African species by Palisot de Beauvois, cannot, however, be used here, as the most characteristic feature of our small species is the loss of the metatarsus which is described by Palisot as present in the African species. I suggest therefore the use of the term Ellipes (ἐλλιπής) for the group.

Our species may be separated by the following table: —

A[1]. Larger forms, more than 5.5 mm. long. Pronotum with a delicate transverse sulcus near middle of anterior half; fore tibiae of male sometimes deeply fissate; hind tibiae with 4 pairs of long natatory lamellae, preceded by slight serrations, and armed at tip on either side with two very unequal calcaria, the longest scarcely longer than the metatarsus, the only member of the tarsi present (TRIDACTYLUS).

b[1]. Larger, from 7–9 mm. long, of highly variegated coloring, especially conspicuous on pronotum and hind femora. . . . . . . *apicalis.*

b[2]. Smaller, from 6–7 mm. long, of tolerably uniform dark fuscous coloring, the hind femora generally feebly and rather inconspicuously but sometimes distinctly marked with testaceous. . . . . . . *terminalis.*

A[2]. Smallest forms, less than 5.5 mm. long. Pronotum with no transverse sulcus; fore tibiae of male never fissate; hind tibiae with a single pair of short natatory subapical lamellae, the margins of the tibiae smooth, armed at tip on either side with two very unequal calcaria, the longest about half as long as the tibia, the tarsus wholly wanting or at least practically invisible (ELLIPES). . . *minuta.*

Tridactylus apicalis Say.

I have seen specimens of this species from Ithaca, N. Y., July 28–30 (Pearce), Quincy, Ill., Sept. (McNeill), Maryland (Uhler), Ames, Iowa, Aug. 14 (Osborn), Kentucky (Wild in Uhler's coll.), Georgia (Morrison), Dallas, Tex. (Boll), San Diego, Cal. (Crotch), Los Angeles, Cal. (Crotch, Morse), San Bernardino, Cal., July 16 (Morse). It has also been reported from several of these points and from Staten Island, N. Y. (Davis), New Jersey (Smith), Indiana (Blatchley), Minnesota (Lugger), Nebraska (Bruner), Carolina (Saussure), Alabama (Scudder), S. Carolina (Burmeister), Council Bluffs, Mo. (Say), St. John's River, Fla. (Say). New Orleans, La. (Guérin), Mexico (Saussure), Guatemala (Saussure), Ecuador (Bolivar), South America (Brunner), and Burmah (!) (Brunner).

Tridactylus terminalis Uhler.

Specimens before me come from Winchester, Mass., Nantucket, Mass., July 13 (Morse), Staten Isl., N. Y., (Davis), Maryland (Uhler), Southern Illinois (Uhler), Carolina (Schaum), Agricultural College, Miss., Oct. (Weed), and Dallas, Tex. (Boll). It has further been reported from Cambridge, Mass. (Scudder), Connecticut (Smith), New York (Beutenmüller), New Jersey (Smith), Indiana (Blatchley), Illinois (McNeill), Minnesota (Lugger), Nebraska (Bruner), Carolina (Saussure), Louisiana (Saussure), Tamaulipas, Mex. (Saussure), and Nicaragua (Bruner.)

Ellipes minuta (Scudder).

I have examined specimens from Southern Illinois (Thomas), Rock Island, Ill. (Walsh), Indiana (Blatchley), Georgia (Morrison), Enterprise, Fla. (Schwarz), Biscayne Bay, Fla. (Mrs. Slosson), Lake Worth, Fla. (Slosson), Charlotte Harbor, on stalk of Spartina near water (Slosson), Palm Beach, Fla. (Slosson), Agricultural College, Miss., Oct. (Weed), Texas, not common, running on margins of streams (Belfrage), Dallas, Tex. (Boll), Palm Springs, Cal., July 13 (Morse), Ahwanee, Cal., Aug. 15 (Morse), and San Bernardino, Cal., July 16 (Morse). It has also been reported from Minnesota (Lugger), Nebraska (Bruner), Mississippi and Florida (Ashmead), Cuba (Saussure), St. Vincent and Grenada (Brunner and Redtenbacher), and Vera Cruz and Tabasco, Mex. (Saussure).

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXX.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Phiasne irrorata Pack. I have described the mature larva (Ent. News, v, 63, 1894).

Egg. Elliptical, strongly flattened, rounded, no angles; one end slightly and only in a small area truncate, the other somewhat depressed; smooth whitish green, the reticulations distinct, broad, elongate transversely, resembling low ridges especially toward the truncate end, irregular, somewhat waved. Size .8 × .6 × .3 mm.

Stage I. Normal, moderately elongate. Head rounded, erect, pale reddish luteous, elongate; clypeus moderate, reaching over half to vertex, pointed; sutures brown; ocelli small, black; width .35 mm. Body cylindrical, shields membranous, concolorous, anal feet spreading, the flap large, rounded. Pale greenish, a broad, dark olive dorsal shade on joints 3 to 12, defining the subventral fold which looks pale by contrast; venter faintly olive; tubercles and setae small, in pale spots in the dorsal space; setae short and stiff, dusky, very minutely enlarged at the tip, normal.

Stage II. Head rounded, somewhat elongate with a high narrow clypeus, held obliquely; pale dull luteous, ocelli black, mouth brown; width .45 mm. Body moderate, segments not elongate, normal, pale translucent green with faintly indicated, narrow, white lines; tubercles large and elevated, most distinct posteriorly, transverse, white; setae short, dark; abdominal feet with very faint brown tint. No shields and practically no marks above. A broad, purple-brown ventral band, the whole length, even on the labium.

Stage III. Head rounded, free, larger than joint 2, pale straw color, a broad light brown stripe up from the antennae to across the center of lobe; width .9 mm. Body cylindrical not elongate, translucent green, not shining, a faint, diffuse, narrow, broken, dorsal line; subventral fold yellowish, venter purple brown. Thoracic feet black, appressed, the feet of joint 10 black outwardly, of 13 green except in front. Tubercles whitish, rounded, slightly elevated. Later no dorsal line but faint longitudinal white lines.

Stage IV. (Green form). Head round, flattened, oblique, clypeus half to vertex, mouth projecting, antennae moderate, divergent; green, whitish in the clypeus, antennae white, mouth brownish shaded; width 1.4 mm. Body cylindrical, slightly narrowed before, normal, moderate; segments obscurely 6-annulate. Green, faintly white lined; thoracic feet and a row of segmentary, diffuse, subconfluent ventral spots and base of foot of joint 10 purple brown. The more distinct pale lines are addorsal, subdorsal, a broad slightly yellowish diffuse one on subventral fold and broken adventral. Tubercles whitish green, roundedly elevated, low. Setae short, obscure. (Brown form). Head broadly brown over the lobes, the edges of the patch mottled, brown marks on sutures and in clypeus. Body pale brown, faintly pale lined; a dark brown dorsal line and broken stigmatal one, rather broad; ventral and foot marks as in the green form. Subventral fold broadly pale.

Stage V. (Green form.) Head green, rounded, flatly outstretched, whitish streaked about clypeus, antennae rather long, yellowish white, mouth pale; width 2 mm. Body cylindrical, subventral fold distinct; uniform, not elongate. Green, whitish over the dorsum, with addorsal, subdorsal and double lateral irregular, faint, whitish lines; subventral fold diffusely yellow. Feet green, normal. Tubercles minute; setae rather long but fine, dusky. A brownish shade at the base of the foot of joint 10. (Brown form.) Head with a large chocolate patch on each lobe shading into reticulations at the edge, leaving the clypeus mostly pale. Body milky chocolate, the subventral fold broadly and diffusely yellow; dorsum and venter with several obscure darker lines. On the sides of joints 2 to 4 and 10 to 11 and on joints 5 to 9, forming nearly completely encircling bands are irregular dark chocolate mottlings. Tubercles chocolate, spiracles pale. The bands vary in extent and distinctness. Foot of joint 11 chocolate; anal plate pale brown. Pupation in the ground.

Food plant. Cottonwood (*Populus fremontii wislezeni*); they will also eat willow. Larvae from Denver, Colorado. Eggs May 11th, mature larva June 7th.

Economic Entomology.— Sanderson's Insects injurious to staple crops (New York, John Wiley and Sons, 1902) contains fifteen chapters devoted to Injury done staple crops by insect pests, Structure and development of insects, General farm practice against injurious insects, Beneficial insects. Insects injurious to grains and grasses, to wheat, to Indian corn, Weevil in grain, Insects injurious to clover, to cotton, to tobacco, to the potato, to the sugar-beet, to the hop-plant, and Insecticides.

The text though compiled and not comprehensive will serve the purpose of the author fairly well; a direct reference to a detailed account of each species would have been of real benefit. Most of the illustrations have been used previously and the source is acknowledged though in some cases inadequately; the helpfulness of some of the original cuts (*e. g.* Figs. 4 and 5) may well be questioned.

PROCEEDINGS OF THE CLUB.

8 March, 1901. The 219th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair.

Mr. Samuel Henshaw was unanimously elected a life member as a token of the Club's appreciation of his generosity.

Mr. C. W. Woodworth remarked on observations he had made on *Aleurodes citri*, which feeds on the under side of the leaves of orange trees in Florida. He gave an interesting account of its anatomy and habits. Among other things he called attention to the curious arrangement of the stigmata and tracheae, owing to the extreme flatness of the insect. He also stated that all the appendages except the mouth organs are shed in early larval life, the insect becoming fastened to the leaf by a secretion. The oesophagus keeps up a regular pulsation, reminding one of that of the heart. Wings are developed in the imagoes and they are locally known by the name of "white flies."

Mr. S. H. Scudder stated that he had recently heard from a correspondent in California that cave-crickets are injurious to mushrooms.

Mr. Woodworth spoke of the curious flight of butterflies of the genus Coenonympha very abundant in California in the autumn.

12 April, 1901. The 220th meeting was held at 156 Brattle St., Mr. S. H. Scudder in the chair. Mr. A. P. Morse acted as Secretary.

Mr. Scudder read a letter from Mr. G. H. Johnson of Bradford, N. H., announcing the capture of *Enodia portlandia* at Webster, N. H.; and one from Mr. H. D. Goodale of Suffield, Conn., concerning a malformed *Euvanessa antiopa*, an example having been bred which entirely lacked the right hind wing.

Mr. Scudder announced his recognition in the U. S. orthopteran fauna of the genus Miogryllus Sauss., and showed four species from the southern United States.

Prof. C. W. Woodworth exhibited drawings and models illustrating in a striking and ingenious manner the peculiarities in venation and wing-folding of several genera of insects belonging to the Forficulidae, Blattidae and Staphylinidae.

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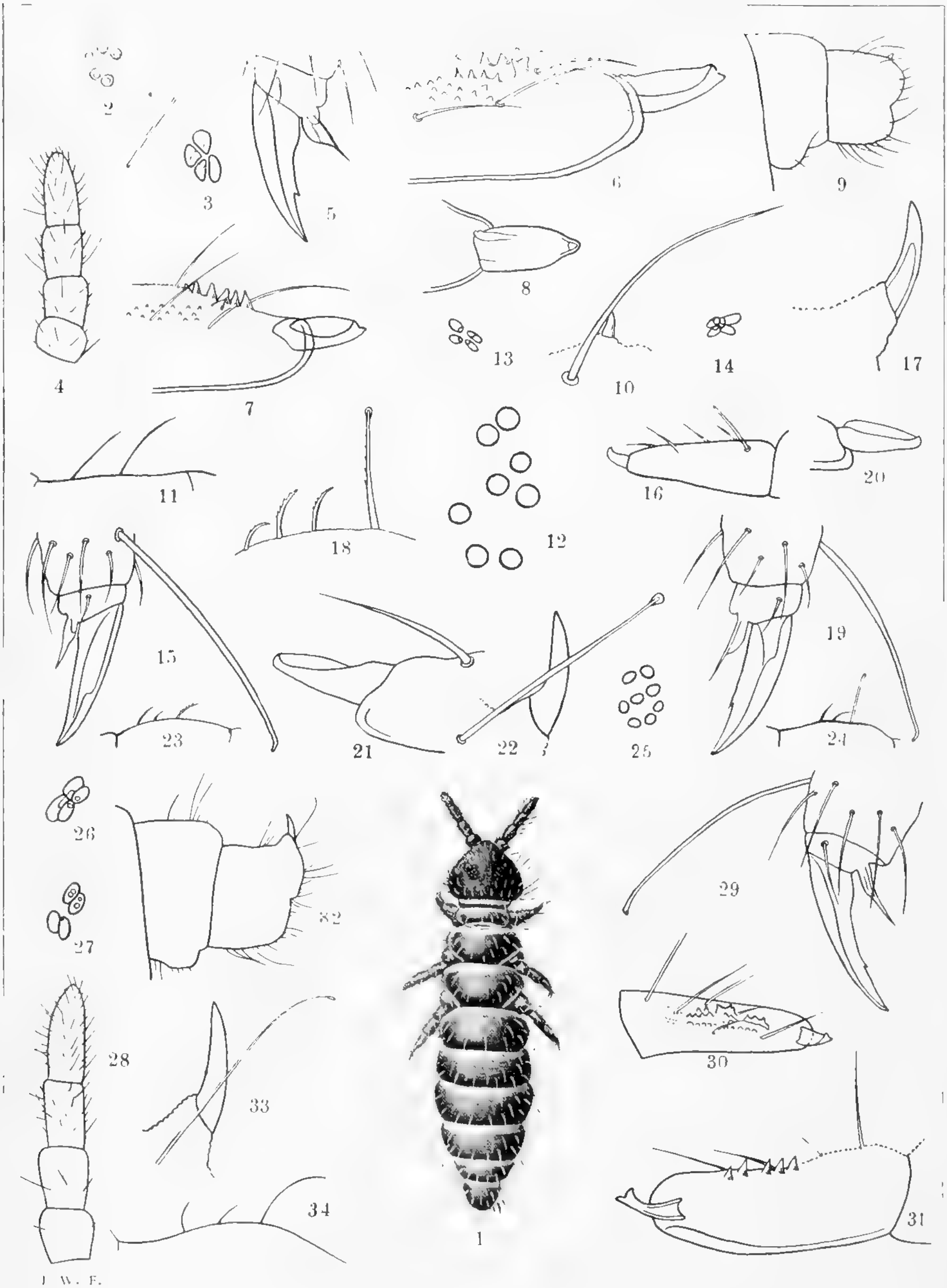
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ACHORUTES.

Explanation of Plate 3.

Fig. 1. *Achorutes nivicola* Fitch, x 25.
" 2. " " " Eyes of left side, x 114.
" 3. " " " Postantennal organ of left side, x 504.
" 4. " " " Antenna, x 78.
" 5. " " " Left hind foot, x 294.
" 6. " " " Left aspect of left mucro and end of dens, x 422.
" 7. " " " Left aspect of left mucro and end of dens, x 354.
" 8. " " " Concave aspect of left mucro, x 504.
" 9. " " " Extremity of abdomen, x 64.
" 10. " " " Anal spine, lateral aspect, x 434.
" 11. " " " Clothing, dorsum of first abdominal segment, x 114.
" 12. *Achorutes packardi*, sp. n. Eyes of left side, x 294.
" 13. " " " Postantennal organ of left side, x 504.
" 14. " " " " " " right side, x 504.
" 15. " " " Left hind foot, x 354.
" 16. " " " Dens and mucro, x 294.
" 17. " " " Anal spine, x 366.
" 18. " " " Clothing, dorsum of first abdominal segment, x 294.
" 19. " " var. *dentatus*, var. n. Left hind foot, x 422.
" 20. " " " Left aspect of right mucro, x 366.
" 21. " " " Right aspect of left mucro, x 504.
" 22. " " " Anal spine, lateral aspect, x 422.
" 23. " " " Clothing, dorsum of first abdominal segment, x 114.
" 24. " " " Clothing, dorsum of third abdominal segment, x 114.
" 25. *Achorutes harveyi* sp. n. Eyes of left side, x 78.
" 26. " " " Postantennal organ of right side, x 504.
" 27. " " " " " " " " x 504.
" 28. " " " Antenna, x 78.
" 29. " " " Right front foot, x 294.
" 30. " " " Left aspect of right dens and mucro, x 147.
" 31. " " " Right dens and mucro, x 294.
" 32. " " " Extremity of abdomen, x 64.
" 33. " " " Left anal spine, x 294.
" 34. " " " Clothing, dorsum of first abdominal segment, x 114.

PSYCHE.

THE IDENTITY OF THE SNOW-FLEA (*ACHORUTES NIVICOLA* FITCH).

BY JUSTUS WATSON FOLSOM, CHAMPAIGN, ILL.

Under the term "snow-flea," several species of Achorutes have been badly mixed. The original description of A. nivicola Fitch is apparently broad enough to entitle three distinct species to the name of "snow-flea," and to make it rather difficult to determine which species Fitch meant. Considerable attention to the subject, however, has enabled me to identify his species to my own satisfaction, and, I hope, to that of other students, because the synonymy of the snow-flea concerns not only our American forms, but also involves certain European species.

The original description of nivicola is becoming inaccessible, but is reprinted in full below, from my copy of Fitch's "Winter Insects of Eastern New York" (1847), and the entire paper has been republished in Lintner's Second Report.

Podura nivicola. "THE SNOW-FLEA."

Black or blue-black; legs and tail dull brown.

Length 0.08.

Body black, covered with a glaucous blue-black powder but slightly adherent, and sparingly clothed with minute hairs; form cylindrical, somewhat broader towards the tail. Antennae short and thick, longer than the head. Legs above blackish, beneath dull brown and much paler than the body. Tail of the same color with the venter, shortish, glabrous on its inner or anterior surface, with minute hairs on the opposite side; its fork brownish.

Though found in the same situations as the European P. nivalis, ours is a much darker colored species. Say's P. bicolor is a larger insect than the one under consideration, and differs also in size and in the color of the tail or spring. From the habits of the present species, we should infer that it might be abundant in all the snow clad regions of the northern parts of this continent; it may therefore prove to be identical with the P. humicola of Otho Fabricius (Fáuna Gröenlandica), of which we are unable to refer to any but short and unsatisfactory descriptions, which do not coincide well with our insect.

This is an abundant species in our forest, in the winter and fore part of spring. At any time in the winter, whenever a few days of mild weather occur, the surface of the snow, often, over whole acres of woodland, may be found sprinkled more or less thickly with these minute fleas, looking, at first sight, as though gunpowder had been there scattered. Hollows and holes in the snow, out of which the insects are unable to throw themselves readily, are often black with the multitudes which here become imprisoned. The fine meal-like powder with which their bodies are coated, enables them to float buoyantly upon the surface of water, without becoming wet. When the snow is melting so as to produce small rivulets coursing along the tracks of the lumberman's sleigh, these snow-fleas are often observed, floating passively in its current, in such numbers as to form continuous strings; whilst the eddies and still pools gather them in such myriads as to wholly hide the element beneath them.

Fitch's types of Collembola are not known to exist, so Dr. Felt wrote me. Fitch's manuscript notes on the order, which belong to the Boston Society of Natural History, I have read and copied, thanks to Mr. Samuel Henshaw; they correct the original description thus: "The antennae and legs are the same color as the body, not reddish or deep brown." (Fitch appears to have had Podura aquatica in mind, in the first instance.) He adds, "In the early spring the buckets and troughs of the manufacturer of maple sugar are often thronged with these insects."

Although the description of Podura nivicola is less specific than is desirable, and has consequently been the source of some confusion,— nevertheless, the evidence which I have collected leaves no reasonable doubt in my mind, as to the identity of Fitch's species.

Three species (here called *nivicola*, *harveyi*, and *packardi*) have been and may be confused, on account of their superficial agreement in form and color, — and only three have any claim to the name of nivicola. These three are not only sharply separated by structural details, but are also so different in time of appearance, abundance, habitat, and habits that they can be determined in the field. The form that I have redescribed as nivicola is the only one that agrees with the original description in being abundant at any time during the winter,— and it may be depended upon to occur in immense numbers every year, in the manner described by Fitch. Harveyi seldom appears before the first of March, in Massachusetts, where it occurs on the trunks of pine and other trees in but moderate numbers. I have it as a "snow-flea" from Maryland, but have never been able to find it as such in Massachusetts, Maine, or New York. Specimens collected for me in a sugar camp in Maine, for the purpose of this discussion, proved to be what I had called nivicola. Finally, Mr. MacGillivray, in response to my request, sent me "snow-fleas" from Osceola, Penn., and Otto, N. Y., saying, "The one from Otto, N. Y., is the common New York species." Both lots consisted of the species that I had already regarded as the real nivicola.

Packard's redescription of nivicola, which subsequent writers have substituted for Fitch's diagnosis, cannot apply to the nivicola established above, on account of the disagreement as to mucrones and anal spines; moreover, nivicola has disappeared from Salem and vicinity by May 7, at the latest,— while Packard gives May 28 and June 6 as two of his three dates. It does not apply to harveyi, for that does not occur much after April 12, except in the egg. Only one species remains to which it might, and does, apply. Packard's specimens of nivicola are lost, unfortunately, but among some unpublished figures (which he kindly gave me), of his Essex County species, are camera-lucida drawings of every essential detail (claws, mucrones, anal spines, etc.) of his nivicola, a form with which I am familiar, and one that cannot be the nivicola of Fitch, on account of appearing too late, if for no other reason. The species which Packard called nivicola, is new and is here named *packardi*.

Lintner repeated Fitch's account of nivicola, supplementing it with Packard's description, upon the assumption that the two descriptions referred to the same species, and added several notices by others upon the occurrence of "snow-fleas." Later, Dr. Lintner ('96, pp. 251 to 252) found that doubt attended the name of nivicola, and, still assuming that Packard's redescription was valid, figured a form from Ghent, N. Y., which agreed with it; this form is actually that which Packard described as nivicola, as I have learned from some of the original Ghent specimens, which were sent me by Dr. Felt. The Schoturus nivicola of Lintner's Eleventh Report, then, is Achorutes packardi n. sp.

The same report (pp. 253 to 254) contains the description of Achorutes diversiceps Lintn. The types of diversiceps, that were loaned to me by Dr. Felt, confirm my conclusion, drawn from Lintner's description and figures, that diversiceps is the form that Fitch named nivicola.

Harvey ('93, pp. 183, 184), without questioning the applicability of Packard's redescription, gave two full form figures to supplement Packard's account. I now have the specimens from which those figures were made, and find them to be Packard's species, indeed, and, therefore, not the nivicola of Fitch.

The queried references in the synonymy below are to popular notices upon insects that are probably, but not unquestionably, the snow-flea described by Fitch.

A. nivicola Fitch occurs in Europe under the names *socialis* Uzel and *spinifer* Schäf. Three Swedish examples of socialis which were determined by Schött and sent me by Schäffer, agree accurately with our nivicola. Schött ('94, p. 82), in fact, adds to his detailed account of socialis, "Es ist nicht unwahrscheinlich dass die von Packard beschriebene Achorutes nivicola, die er meiner Ansicht nach aus guten Grunden mit Fitch's Podura nivicola gleichstellt, keine andere als obige Art sei." This surmise, incorrect as to the supposed equivalence of Packard's and Fitch's species, is correct as regards the identity of socialis Uzel and nivicola Fitch.

I sent American specimens to Dr. Schäffer, who replied, "Achorutes nivicola Fitch erweist sich in den Formmerkmalen mit meinem Achorutes spinifer ubereinstimmend. Ach. spinifer ist darnach eine (kleinere) Farbenvarietät von A. nivicola Fitch."

A. nivicola is closely allied to *A. harveyi* n. sp., from which it may be separated by its stout superior claws, ovate inferiors, small anal spines on a cylindrical segment, and clothing of long subequal setae.

Each of the three species discussed above is characterized below. Unless otherwise specified, the material referred to was collected by the author, and is owned by him; examples of each species, however, have been given to the Museum of Comparative Zoölogy, Cambridge, Mass.

Achorutes nivicola Fitch.

(Figs. 1–11.)

Podura nivicola Fitch, Amer. Journ. Sc. Agric., vol. 5 (1847) pp. 283–284 and vol. 6 (1847) p. 152; Winter Ins. E. N. Y. (1847) pp. 10–11 (reprinted by Lintner, Second Rept. (1885), pp. 204, 205, 244. Fitch, Rural New Yorker, vol. 8 (1857). ? McMinn, Proc. Acad. Nat. Sc. Phila., vol. 4 (1849) p. 246. ? Ashton, Proc. Ent. Soc. Phila., vol. 1 (1861) p. 32 (repr. Lint. Sec. Rept., p. 204). ? Walsh, Riley, Amer. Ent., vol. 1 (1869) p. 188. ? Field and Forest, vol. 2 (1877) pp. 146–147 (repr. Lint. Sec. Rept., p. 205). 5 6

Achorutes socialis Uzel, Thys. Boh. (1890) pp. 69–70, tab. 2, figs. 16–19. Schött, Syst. Verb. (1894) pp. 81–82, taf. 7, figs. 6–8. Schäffer, Coll. Hamburg (1896) p. 172.

Achorutes nivicola MacGillivray, Can. Ent., vol. 23 (1891) p. 274.

Schoturus nivicola MacGillivray, Can. Ent., vol. 25 (1893) p. 316. Dalla Torre, Gatt. Arten Apt. (1895) p. 13.

Achorutes spinifer Schäffer, Coll. Hamburg (1896) pp. 172, 174, taf. 3, fig. 51.

Achorutes diversiceps Lintner! Eleventh Rept. (1896) pp. 253–254, figs. 23–25. (Ref. to Country Gentleman, Mar. 22, 1879, p. 327.)

Dark indigo blue throughout (fig. 1). Eyes (fig. 2) sixteen. Postantennal organs (fig. 3) of four elements. Antennae (fig. 4) almost as long as the head, with segments as 7 : 9 : 10 : 15; basal segment subglobose, second and third subcylindrical, fourth rounded conical. Body elongate, abdomen subfusiform, last segment cylindrical. Superior claws (fig. 5) stout, slightly curved, unidentate two fifths from the apex; inferior claws half as long, basally subovate, apically acicular; one long tenent hair with a minute knob; distal tibial hairs minutely knobbed. Manubrium as long as the rest of the furcula; dentes (figs. 6, 7) stout, subcylindrical, apically broad and rounded, bearing four to six prominent, acutely conical teeth, of which one is more lateral than the others; in addition, there are usually fifteen to seventeen small outer teeth; mucrones (fig. 8) inserted on inner side of the apex of each dens and rather boat-shaped; in profile, suboblong, feebly curved, apex retuse or emarginate. Anal spines (figs. 9, 10) two, small, conical, erect, upon low, separated papillae. Clothing (fig. 11) of numerous long curving hairs and few short curved setae. Length, 2 mm.

Norway, Maine, May 7, F. Howe, Jr.; Orono, Maine, March, April 15, May 6, F. L. Harvey. Arlington, Massachusetts, April 12, Belmont, Massachusetts, April 19, May 5; Winchester, Massachusetts, February 9, R. W. Hall; Karner, New York, April 26, J. A. Lintner (N. Y. State Coll.); Otto, New York, J. H. Comstock; Osceola, Pennsylvania, A. D. MacGillivray.

Achorutes packardi sp. n.

(Figs. 12–18.)

Achorutes nivicola Packard, Thys. Essex Co. (1873) pp. 29–30. Lintner Second Rept. (1885) p. 203. MacGillivray, Can. Ent., vol. 23 (1891) p. 274. Harvey! Ent. News, vol. 4 (1893) p. 183, figs. 5, 6.

Schoturus nivicola Lintner! Eleventh Rept. (1896) pp. 251–252, figs. 21, 22.

Dark indigo blue throughout. Eyes (fig. 12) sixteen. Post-antennal organs (figs. 13, 14) of four elliptical-oval elements. Antennae shorter than the head, with segments as 5 : 8 : 7 : 10 ; basal segment globose, second and third slightly expanding, fourth subcylindrical with rounded apex. Body subcylindrical. Superior claws (fig. 15) broad, almost straight, untoothed ; inferior claws of hind feet two fifths as long as the superiors, slender, lanceolate, acuminate ; of the remaining feet, one fourth as long, small ; tenent hair stout, exceeding the large claw, apex bent. Manubrium as long as the rest of the furcula ; dentes (fig. 16) one sixth as long, oblong, distally rounded, terminating in an upturned tooth. Anal spines (fig. 17) two, three fifths as long as a superior claw, stout, feebly curved, erect ; upon contiguous papillae. Clothing (fig. 18) of many stout curving serrate setae of moderate length and fewer long erect capitate setae, more or less serrate. Length, 2 mm.

This is the species that Packard redescribed as nivicola Fitch. Packard's specimens are not in the Museum of Comparative Zoölogy, with the rest of his Essex County material, but I am in possession of his original drawings, which leave no doubt as to what species he regarded as nivicola. Harvey and Lintner depended upon Packard's account of nivicola, and the specimens to which they applied that name are, indeed, the same species that Packard had in hand ; this I have learned from an examination of the identical specimens that Harvey and Lintner used in preparing the papers mentioned above in the synonymy.

As I have good reasons (already given) for believing that the nivicola of Packard is not that of Fitch, and needs a new name, I gladly name it *packardi*.

Toronto, Ontario, June 26, R. J. Crew; Orono, Maine, February, F. L. Harvey; Cambridge, Massachusetts, April 17; Lexington, Massachusetts, May 10, 11; Ghent, New York, April 13, E. C. Powell (N. Y. State Coll.) ; Newark, Maryland, January 24, Beckwith (N. Y. State Coll.).

This species is frequently found on red maple trees, crawling on the trunk or remaining under the bark or in crevices, especially about the base of a tree. I have occasionally found it under the bark of pine, oak, and apple trees, or about the roots ; or clustered under moss on a stone. Full grown individuals occur from mid April until the middle of June ; a second brood begins to appear late in June and has disappeared by the last of August. I have twice (April 22, 29) found abundant eggs of this species under the loose moist bark of red maple roots, protected by the sod ; they were pale yellow, spherical, 135 micra in diameter, occurred in irregular masses and hatched in a little under one month.

Achorutes packardi, var. *dentatus*, var. n.

(Figs. 19–24.)

In this variety all the superior claws (fig. 19) are unidentate, the mucrones (figs. 20, 21) are one fourth as long as the dentes, slender and laterally lamellate, the anal spines (fig. 22) are slender, while the stout erect setae are either not capitate (fig. 23), or else are obscurely capitate on the posterior part of the abdomen (fig. 24). In all other respects the variety agrees with the typical form.

Orono, Maine, March 10, 15, May 11, F. L. Harvey; Arlington, Massachusetts, April 10, 13, 23, 30, May 23, September 10; Ghent, New York, April 13, E. C. Powell (N. Y. State Coll.).

This variety lives under the loose bark of pine, red maple, and oak trees, especially at the base of the roots, and sometimes occurs on snow. It has at least three broods, which mature at intervals of six or seven weeks.

Dentatus is a seasonal variety of packardi. Young individuals that hatched May 20 from eggs laid by the variety dentatus were not that variety, but were the typical form, with bulbiferous setae, no teeth on the superior claws, and with lamellate mucrones. One of the four specimens from Ghent, N. Y., was the variety dentatus, the others being the typical form.

This is the first record of seasonal dimorphism among the Collembola, although I suspect that certain other species also assume disguises, according to the season in which they occur. This can be proved, however, only by careful breeding experiments, which are difficult to conduct accurately with these insects.

Achorutes harveyi sp. n.

(Figs. 25–34.)

Dark indigo blue throughout. Eyes (fig. 25) sixteen. Postantennal organs (figs. 26, 27) of four elliptical-oval elements. Antennae (fig. 28) subequal to the head in length, with segments as 10: 13: 13: 20; first two segments subclavate, last two subcylindrical. Body elongate, abdomen subfusiform. Superior claws (fig. 29) slender, tapering, slightly curved, unidentate about one third from the apex; inferior claws less than half as long, basal half suboblong, apical half acicular; one long tenent hair with bent apex. Manubrium as long as the rest of the furcula; dentes stout, subcylindrical, apically broad and rounded, projecting beyond the bases of the mucrones, bearing two rows of teeth (fig. 30), fourteen to twenty-five in number, which are variable in size, and are more or less confluent basally; five may be much larger than the others (fig. 31), and sometimes no teeth are present; mucrones (fig. 31) one fourth as long as dentes, in profile suboblong, dorsally concave, apically emarginate. Anal spines (figs. 32, 33) two, long (almost as long as a superior claw), slender, feebly curved, upon prominent approximate papillae. Clothing (fig. 34) of numerous curving setae and fewer bowed hairs. Length, 2 mm.

This species is much like nivicola, but differs chiefly in having slender superior claws, suboblong inferiors, long anal spines, and clothing of another type.

Orono, Maine, F. L. Harvey; Arlington, Massachusetts, January 16, March 1, 10, 20, April 8, 9, 12; Annapolis, Maryland, January 15, C. E. Munroe (M. C. Z.).

This species occurs, long before snow has gone, in large colonies, under loose wet bark and under soil, in crevices at the base of a tree. Although most common on pine, it lives also on elm and apple. In mild weather, it wanders about on the trunks of trees or on the ground, and it occurred in enormous numbers as a "snow-flea," in Maryland, as recorded above. Captive specimens laid eggs between April 9 and April 13. On April 12, I found abundant eggs of this species among a colony of adults at the base of a white pine; the eggs were white, spherical, and deposited in irregular heaps.

I have never been able to find this species in its customary haunts at any time of the year after April 12; it is probably at least digoneutic, however, and may prove to be dimorphic.

ON THE LIMITS OF THE FAMILY SATURNIIDAE, WITH A NOTE ON THE GENUS ROTHSCHILDIA.

BY A. S. PACKARD, PROVIDENCE, R. I.

The elimination of so many non-spinning genera from the Saturniidae as proposed in this paper leaves that family very much curtailed.

As I pointed out some years ago,* it is divided into two subfamilies, of very simple larval characters, i. e., whether the two dorso-median tubercles of the 8th abdominal segment of the larva remain separate, or are united in a single median one.

The subfamily Saturniinae, characterized by having six separate tubercles (the two median ones being separate) on the 8th abdominal segment, comprise the following genera, Perisomena, Cricula, Saturnia (I cannot see that *Calosaturnia mendocino* differs from Saturnia), Heniocha, Loepa.

The subfamily *Attacinae* was at the same time characterized by the larvae having but five tubercles on the 8th abdominal segment, the median one being double, resulting from the fusion of the tubercles belonging to the two dorsal series. The imaginal characters bear out this arrangement.

The following genera belong to this group, beginning as heretofore with the most generalized forms, the exact sequence being subject to farther modification: Copaxa, Opodiphtera, Tagoropsis, Syntherata, Rhodia, Rinaca, Neoris, Caligula, Graellsia, Argema, Actias, Tropaea, Antheraea, Telea, Metosamia, Callosamia, Samia, Epiphora, Philosamia, Rothschildia, Coscinocera, Attacus.

* Studies on the transformation of moths of the family Saturniidae. Proc. Amer. Acad. Arts and Sciences, Boston, (n. s.) XX, p. 58. 1893.

This subfamily is divided into several, at least five groups of genera, in two series, for example a Copaxa group, an Antheraea group (Antheraea, Telea, Metosamia); a Samia group (Samia, Epiphora, Callosamia) a Tropaea group (Graellsia, Argema, Actias, Tropaea), and an Attacus group (Rothschildia, Philosamia, Attacus).

Whether Rhodia, Rinaca, and Neoris belong with Loepa, which has six tubercles on the 8th abdominal segment, or with Copaxa which in stage I has but five, the median one being double, reremains to be seen after we know more of their larval forms.

Note on the genus Rothschildia.

As originally written, I had proposed a new generic name for the American Moths referred to Attacus.*

This name was proposed by Mr. Grote for the American, chiefly Naeogaeic, species heretofore referred to Attacus. The latter genus, comprising *Attacus atlas*, *A. crameri* and *A. edwardsii*, is restricted to southeastern Asia and the East Indian Archipelago or the oriental region. In fact it is much more closely related to Philosamia than to Rothschildia.

From a study of the venation and other features of six species of Rothschildia, it becomes quite evident that the new world or naeogaeic species form a group readily separated from the species of Attacus of the Oriental region, both by the larval and imaginal characters, though in the general appearance of the moths, the shape of the wings and markings there is a close resemblance.

Rothschildia differs from Attacus in the following characters; the antennae have pectinations nearly one-half shorter, and the end of the antenna is subfiliform; the palpi are 3-jointed, those of Attacus 1-jointed; the fore tibial epiphysis is in Rothschildia narrow, very sharp at the end, about half as wide as in Attacus, in which (*A. atlas*) it is oval, and the end obtuse.

The fore wings are less falcate than in Attacus, and the hind wings more rounded at the inner angle, not so triangular in outline as in Attacus, nor so much produced posteriorly: indeed they are closely like those of Philosamia.

In the venation the difference between the Asiatic and American forms is striking; in all the Rothschildiae examined there is no first subcostal vein (or vein II.). In *Attacus atlas*, *crameri*, and *edwardsii* the first branch of the subcostal vein is fully developed, arising at a point near the middle of the discal cell, *i. e.*, within the origin of the common stalk of the other subcostal branches. In this respect it is closely allied to Philosamia, where vein II is present. Vein II_2 is minute, very short; II_3 present, normal. In Rothschildia vein II is wanting, II_2

* After this article was put in type and a day before receiving the proof, I received by Mr. Grote his excellent article, Beitrag zur Classification der Schmetterlinge, 1896, in which he separates the American species of Attacus under the name of Rothschildia. I therefore suppress the generic name I had proposed. The characters he gives are essentially what I have pointed out in the present article. We seem, quite independently of each other, to have arrived at the same results.

is a little longer than in Attacus and the other veins of the wings are as in Attacus. The venation of the hind wings is nearly the same in both genera. The wonderful similarity of markings, especially the large, clear discal spots in genera quite remote is an interesting case of convergence.

The larva of Rothschildia approaches Samia, rather than Attacus. That of *A. atlas* has been well described and carefully figured in all stages by M. Poujade, (Annales Soc. Ent. France, X, 1880; p. 183, Pl. 8.)

The larva of *Attacus atlas* in its final stage is provided with long finger-shaped tubercles; those, however, on the tergum of the 2d and 3d thoracic segments are very different in shape, being large, short and rounded, those on the abdominal segments long and slender. Reduction occurs on the thoracic segments only; the two rows of tubercles on the sides of the thoracic segments are of the same shape, but a little longer than those on the abdominal segments.

In Rothschildia, as shown by blown examples of *Rothschildia orizaba* received from Mexico, the tubercles are more rudimentary; they are low, short, fleshy, and are crowned with 5–7 small sharp spinules, while those of *Attacus atlas* are long, finger-shaped and unarmed with any spinules. The median tubercle on the 8th abdominal segment is very small, inconspicuous, and but slightly larger than the other dorsal tubercles of the abdominal segments. The dorsal tubercles on the meso- and metathoracic segments are scarcely larger, if any, than those in the abdominal segments.

Burmeister has figured the larvae of *Rothschildia hesperus*, *ethra*, *aurota*, *betis*, and *speculifer*. In all except *R. betis*, they agree well with the larva of *R. orizaba*; the thoracic dorsal tubercles being no larger than the abdominal ones, this species approaching nearest to *R. aurota*. In *R. betis*, however, no traces of tubercles are given, and in the text it is stated that the larva has no spines; the larva is blackish, banded transversely with deep pink-red. The larvae, then, of the American species hitherto referred to Attacus, appear to present excellent distinctive characters.

Judging by the larvae, whose tubercles are more like those of Samia, Rothschildia is the more primitive type, and Attacus the more specialized. Attacus is in venation and the shape of the wings closely allied to Philosamia (*P. cynthia*) its larva is more specialized than that of Philosamia; but the latter has begun to be specialized in the reduction of the dorsal tubercles of the prothoracic segment, which are short, rounded, and unarmed.

Attacus is confined to the Oriental region, while the older more primitive genus Philosamia is represented in equatorial Africa as well as the East Indies; it is probable that the Ethiopian realm was the original home of these two genera, unless Attacus separated after migration into the East Indies, India and the East Indian Archipelago.

A NEW BRUCHOPHAGUS FROM MEXICO.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

The following interesting new Eurytomid belonging to the genus Bruchophagus was received by Dr. L. O. Howard, from Mr. A. L. Herrera, of Coahuila, Mexico, who bred it from the Cotton-weevil *Anthonomus grandis*.

Bruchophagus herrerae sp. nov.

♀.— Length 4 mm. Black, umbilicately punctate and clothed with a fine white pubescence; the tips of front and hind femora, their tibiae and sutures of their trochanters and middle legs from the second joint of trochanters, except a spot at base of the femora, are honey-yellow, while the tarsi are pale, almost white; the wings are hyaline, the tegulae black, the veins pale yellowish, the stigmal and marginal veins about equal and a little shorter than the post-marginal. The abdomen is conically pointed, very slightly longer than the head and thorax united, the petiole being short, smooth above, the second segment highly polished impunctate, the third, fourth, and fifth segments shining but feebly delicately shagreened, the fifth being the longest segment, the sixth and seventh more distinctly and opaquely shagreened and with sparse white hairs; the seventh has a distinct rounded spiracle; the eighth is conically pointed with oval spiracles.

Both antennae are broken off and cannot be described.

Type.— Cat. No. 6139, U. S. N. M.

Hab.— Coahuila, Mexico.

Host.— Coleop. *Anthonomus grandis Boh.*

PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

AN INTERESTING CASE OF MIMICRY.

BY HERBERT OSBORN, COLUMBUS, OHIO.

Some time ago I received from Mr. C. W. Mally, Assistant Entomologist, Cape Town, S. Africa, some specimens of a species of Homopteron which exhibits in a quite remarkable manner the adoption of a form and appearance which must serve it as a most efficient protection.

The insect itself *Cephalelus infumatus* is a little over half an inch long, of a brown color, and has a remarkably prolonged head which anteriorly tapers into a very large spine. This prolonged head is almost one half the total length of the insect. The body is slender and the wings terminate posteriorly somewhat abruptly but in such a manner that they fit very perfectly upon the stem of the plant which is its ordinary food.

The protective feature comes in from the fact that the aborted leaf sheaths on the stem of the plant form sharp spines occurring at intervals along the length of the stem and these are perfectly reproduced in the form and color of the insect. So close is the resemblance that when a number of the spines are mounted separately along side of the insects it is very difficult to distinguish them without the most careful scrutiny. When the specimens were first received I had looked them over some time before noticing that a number were not insects at all but simply spurs and had there not been one mounted with a fragment of stem along with an insect beside it I might have taken a much longer time to make the discovery. I have shown the set to a number of individuals who have taken quite a little time to make the same discovery.

This species was described many years ago by Percheron (Guerin. Mag. de Zool. II. IX. Pl. 48) and has been figured by Burmeister (Genera Insectorum Pl. 4.) and is mentioned in later works on African insects, but so far as I have been able to find there is no mention made of its foodplant or of the remarkable mimicry it presents. If collected without attention to the foodplant or noticing the peculiar spines which it resembles there would be no suspicion that such mimicry occurs.

According to Mr. Mally the insect lives on the rush, *Dovea tectorum* Masters, the spines of which are mimicked. I may mention that the stems are green while the aborted sheaths are dark brown.

A NEW SILPHID BEETLE FROM A SIMPLE INSECT-TRAP.*

BY A. LEONARD MELANDER, AUSTIN, TEX.

The curiosity of an investigating ant may sometimes lead it to destruction. During the month of November last, having had occasion to use a large quantity of the common Texas "stinging red ant" (*Pogonomyrmex barbatus* var. *molefaciens* Buckley) we selected as the easiest and quickest method of capture a novel expedient. A number of four-ounce bottles were sunk in the gravel nest-heap close to the entrance, nearly to the level of the ground, and then were left opened. The ants ready to resent this disturbance immediately hurried up the little embankment to the open bottles and in their precipitous rush fell headlong over the edge, after which they were unable to crawl up the smooth surface of the glass. After the first excitement the ants largely neglected the traps but now and then a passer-by would peer over the edge, doubtless called there by the stridulation of the ants within, and losing its insecure foothold would topple over into the bottle.

In the course of our regular visits to these automatic traps we noticed that in the early morning each bottle invariably contained one or more specimens of a small fly that quickly effected its escape at the slightest noise. After several vain attempts the flies were at last secured by simply corking the bottle, and upon examination proved to be a form belonging to the cave-dwelling genus *Leria* (*Blepharoptera*), *L. pectinata*, originally described by Dr. Loew from this state.

The propensity of this species to seek a bottle as a substitute for a burrow opens a new and interesting field for collecting myrmecophilous and cavern-frequenting insects. That this fly is probably a true myrmecophile, habitually using the burrows of the agricultural ant as its domicile, is quite possible, and even probable when we consider that only the bottles sunk in the ant-nests yielded specimens, though numerous bottles had been arranged as control experiments in the open fields close by, and moreover even if placed on the ant-bed the bottles never contained a fly when there were no ants within.

Aside from the *Leria* and the ever-present *Eleodes tricostata*, which in its capacity of scavenger is always found scurrying over the ant-beds, another insect was taken in great numbers. This one, an exceedingly active little Silphid beetle, is closely related to *Ptomophagus parasitus* Leconte, another ant-guest, which has been taken in the Eastern States in nests of Formica. The present beetle belongs to the division Catopomorphus of the genus, but distinctly differs from its relative in the approximation of the elytral strigae, and in its selection of a host of another sub-

*Contributions from the Zoological Laboratory of the University of Texas No. 28.

family — a biological difference that must not be underrated.*

Although a number of the flies and beetles were confined in the bottles with the ants for several days they rested unharmed, evidently the closest intimacy existing between the three. The beetles would run about among the ants or fly in the bottle with a quick darting movement, but at no time were the ants observed to molest either of their guests. This is interesting especially in the case of the Leria which has never before been found associating with ants, and which, were the ants unfriendly toward it, might be supposed to have accidently used the ant-burrow in place of some other suitable excavation.

Ptomophagus texanus sp. nov.

Length 2.75–3. mm. Form elongate oval, Mordellid-like, slightly narrowed posteriorly; color dark castaneous, shining, thorax almost piceous. Head, thorax, and elytra uniformly, closely and finely strigose, the strigae provided with short closely-placed, uniform, golden yellow pubescence; that of the head radiating from the vertex, that of the thorax and elytra directed straight backwards. Antennae not reaching the hind angles of the thorax, the first four joints fuscous, moderately slender, the first and second joints long, joints six to eleven broader and shorter, piceous, the eighth joint two-thirds as long as the ninth, and not appreciably narrower. Thorax fully two-thirds as long as the width of its base, the sides gradually then quickly narrowing in front, hind angles acute, base feebly but distinctly bisinuate, the narrow hind margin more or less castaneous; disc of the thorax strigose as well as the sides, the strigae conforming more or less with the front margin. The strigae of the elytra not transverse but more or less conforming with the posterior margin: sutural stria well impressed nearly to the apex; sutural angles rounded in the male, but provided with a distinct angle in the female. Body beneath finely and sparsely punctate and pubescent, the femora wholly strigose similarly to the upper surface of the body: tibial spurs equal, those of the hind legs one-third the length of the metatarsus.

Described from ten males, and thirteen females, taken, as above mentioned, at Austin, Texas. The front tarsi of the male are flattened and broadened. The tips of the tibiae are fimbriate apically with short equal spines, which, as the strigosity of the thorax is distinct, further confirm Dr. Horn's statement that these characters are correlated in this genus.

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*In a list of the myrmecophilous Coleoptera of Northern America Mr. E. A. Schwarz in 1890 notices the occurrence of another Ptomophagus in ant-nests but as far as I am aware this species has not yet been described. *Leria pectinata* has previously been found by Mr. H. G. Hubbard associating with *Ptomophagus fisus* Horn in the upper burrows of desert rodents in Arizona. (Proc. Ent. Soc. Wash. IV., p. 362). In this connection may be cited the finding of Ptomophagus in a cave (*Pt. cavernicola* Schwarz), a habit further bearing on the preceding observation.

SOME NEW GENERA AND SPECIES OF ATTIDAE FROM SOUTH AFRICA.

BY GEORGE W. PECKHAM AND ELIZABETH G. PECKHAM, MILWAUKEE, WIS.

FISSIDENTATI.

TUSITALA, gen. nov.

The cephalothorax is high, with the sides sloping outward from the upper surface and widening in a gentle curve from front to back, the widest point being behind the dorsal eyes. The cephalic part is inclined forward, and the thoracic rounds off rather steeply from the third row of eyes. The quadrangle occupies from two-fifths to nearly one-half of the cephalothorax, is one-third wider than long and is wider behind than in front. The first row of eyes is straight or a little curved down, the eyes are large, the middle being less than twice the size of the lateral and subtouching, while the lateral are well separated from them. The second row is equally distant from the first and third or is a little nearer the first, and the third is narrower than the cephalothorax. The falces are long, strong, and vertical, and are bowed, with a compound tooth on the inferior margin. The males have a stiff ridge of hairs on the front face. The sternum is oblong and truncated. The first coxae are separated by about the width of the labium, which is longer than wide.

This genus is founded upon *T. barbata* and includes a second species, *T. hirsuta*, both from South Africa.

TUSITALA BARBATA, sp. nov.

♂. Length 6.5 mm. Legs 1432, about equal in thickness. The first pair is plainly the longest but the others do not differ much in length.

The cephalothorax is covered with a mixture of red, yellow and white hairs, the red predominating on the sides, and the white on the upper surface. The clypeus is less than half as wide as the middle eyes of the first row, and is yellow with a few white hairs. The falces are light brown, and have a remarkable ornament in the shape of a long ridge of stiff hairs down the front face. These hairs stand out stiffly, but their tips curve inward to meet those of the opposite side in the middle line. Their color is snowy-white on the upper half and deep black on the lower. The palpus is slender with long joints, the tibia much exceeding the tarsus. The femur and tarsus are dark colored, the patella and tibia, pale. The legs are brown with darker bars. The abdomen is covered with a mixture of gray and brown hairs. There is a white band around the base, and the posterior dorsum has some indistinct white chevrons.

We have six males from Algoa Bay, South Africa, sent to us by Dr. Braun.

TUSITALA HIRSUTA, sp. nov.

♂. Length 8 mm. Legs $1\overline{23}4$, first and second a little the stoutest.

In our single specimen the cephalothorax is much darker than the abdomen, but both are rubbed quite bare of markings excepting some long white hairs at the front end of the abdomen. The clypeus is as wide as the large eyes of the first row, and is brown with long white hairs. The falces are long and strongly bowed, approaching each other at the extremities. They have ridges of stiff hairs, as in *T. barbata*, on the front faces, which are light brown in color and grow longer and thicker in the lower than in the upper half. The palpus is long and slender, the tibia being much longer than the tarsus. The patella and tibia are much lighter in color than the femur and tarsus. The legs are brown, the first and second pairs being darker than the third and fourth.

We have one male from Zululand, given to us by Rev. Henry C. McCook.

Monclova, gen. nov.

The cephalothorax is long, with nearly parallel sides, which narrow a little at the posterior end. It is moderately high at the third row of eyes, from which point it slopes abruptly in both directions, but more steeply behind than in front. The quadrangle of the eyes occupies nearly half of the cephalothorax, is a little wider behind than in front, and is one-third wider than long. The first row is very slightly curved downward, with the middle eyes subtouching and less than twice as large as the lateral, which are a little separated from them. The second row is about halfway between the first and the third. The third row is as wide as the cephalothorax. The falces are vertical and parallel. The sternum is oval, truncated in front, and narrows in front and behind. The first coxae are separated by the width of the labium, which is about as wide as long.

The type is a new species from South Africa, *M. braunii.*

Monclova braunii, sp. nov.

♀. Length 7 mm. Legs $\overline{43}\,\overline{12}$, the third and fourth plainly longer than the first and second.

The spider is covered with a mixture of white, black, and bright rufus hairs, the different colors predominating on different parts so as to form the markings. Thus the cephalic plate is bright rufus and the middle line on the thoracic part pure white, while the abdomen shows a white band around the anterior end, and, on the posterior part of the dorsum, wide alternating transverse bands of rufus and black. These bands are not parallel but run upward and forward from the sides. The clypeus has long white hairs, and these are continued, rather sparsely, on to the falces. The legs are not conspicuous, being of a light brown color with darker rings and white hairs. The light brown palpus is covered with white hairs.

We have four females, sent by Dr. Braun, from Cape Colony.

UNIDENTATI.

Jasoda, gen. nov.

The cephalothorax is high, with the sides nearly vertical and not far from parallel, although there is a slight swelling at the dorsal eyes, beyond which there is a very gradual contraction toward the posterior end. The cephalic part is a little inclined forward and the thoracic rounds off directly behind the dorsal eyes, falling more steeply after the first half. The quadrangle of the eyes occupies two-fifths of the cephalothorax, is nearly twice as wide as long, and is a very little wider behind than in front. The first row is curved downward, the eyes being small, and all separated, the lateral by nearly their diameter from the middle. The middle eyes are less than twice as large as the lateral. The second row is a little nearer the first than the third, and the third is nearly as wide as the cephalothorax. The falces are vertical, long, heavy, and parallel, with a short fang. There is one conical tooth on the inferior margin. The sternum is oblong, narrowing in front and behind and truncated in front. The first coxae are separated by about the width of the labium, which is longer than wide.

The eyes of this genus resemble those of *Euryattus* and *Simaetha*, but these genera belong respectively to the Pluridentati and the Fissidentati. Moreover the joints of the palpus are differently formed and proportioned, being flattened, with the tibia much longer than the tarsus, in *Euryattus* and *Simaetha*.

The type is a new species from Mashonaland.

Jasoda woodii, sp. nov.

♂. Length 7 mm. Legs $1\overline{34}2$, not slender, nearly equal in thickness.

In our single specimen the cephalothorax and abdomen are both rubbed so that no idea of the marking can be formed. The cephalothorax is dark, almost black, with violet reflections. The abdomen is also dark but not glistening, and shows some long white hairs at the anterior end and on the sides. There are some long whitish hairs on the falces at the lower outer corner. The legs are light brown with slender black spines. The palpi are covered with white hairs.

We have one male sent to us by Mr. Guy A. K. Marshall, from Mashonaland, South Africa.

Mexcala, gen. nov.

The cephalothorax is moderately high. It widens out more below than above, and is broader in the posterior part than in front. There is no marked difference in the planes of the cephalic and thoracic parts. The cephalic part is flat, and the thoracic falls from the dorsal eyes. The quadrangle of the eyes occupies a little more than one-third of the cephalothorax, is one-sixth wider than long, and is equally wide in front and behind. The anterior eyes are moderately large, the middle being less than twice as large as the lateral, and form a slightly curved row. The middle eyes are subtouching, with the lateral a little separated from them. The second row is halfway between the other two. The third row is a little narrower than the cephalothorax. The falces are vertical and stout, with a short fang, and have one conical tooth on the inferior margin. The sternum is oval, and truncated in front. The first coxae are separated by about the width of the labium, which is longer than wide. The pedicle is not visible. There are no constrictions. The abdomen is narrow in front and then widens.

Mexcala is distinguished from the other ant-like genera of this region by having a single conical tooth on the inferior margin of the falx.

MEXCALA RUFA, sp. nov.

♂. Length 8 mm. Legs 4132, almost equal in stoutness, femora slightly thickened. The cephalothorax is dark colored with a few black hairs on the eye-region, and some tiny white scale-like hairs on the front of the falces, and the lower edge of the clypeus, which pass around a little way, onto the sides of the cephalic part. The legs and palpi are black. The abdomen in our specimen, is rubbed, but seems to have been entirely covered with golden-yellow hairs which shade to white on the venter.

We have one male from Cape Colony, sent to us by Dr. Braun.

QUEKETTIA, gen. nov.

The cephalothorax is rather low, and is narrow in front, widening out behind the third row of eyes and then contracting behind. The upper surface is flat and almost entirely on the same plane, there being the gentlest possible rise from the two ends to the dorsal eyes. It is a little wider below than above. The quadrangle of the eyes is very slightly wider than long, is wider behind than in front, and occupies two-fifths of the cephalothorax. The anterior eyes are subtouching, in a straight row, the middle being twice as large as the lateral. The second row is much nearer the first than the third, and the third row is not quite so wide as the cephalothorax. The falces are very short, vertical and parallel with no tooth on the inferior margin. The sternum is oval, truncated in front. The first coxae are separated by a little more than the width of the labium, which is as wide as long. The pedicle is not visible from above. The relative length of the legs is $4\overline{12}3$, the first and second being short and much thickened, especially as to the femur and tibia. The type species is 6.5 mm. long.

The short chubby front legs are enough to distinguish *Quekettia* from others of the group. The type is our *Leptorchestes georgii* from Madagascar, *Ant-like Attidae*, p. 52.

This genus is named for Mr. J. F. Quekett, Curator of the Durban Museum, Natal, South Africa.

KIMA gen. nov.

The cephalothorax is long, and has the sides nearly parallel. The cephalic part is on a higher plane than the thoracic which falls gently from the dorsal eyes. The upper surface is narrow, the sides widening out a very little below. The quadrangle of the eyes occupies two-fifths of the cephalothorax, is nearly as long as wide, and is equally wide in front and behind. The anterior eyes are placed close together and form a row that is a little curved downward, the middle eyes being about twice as large as the lateral. The second row is much nearer the first than the third. The third row is nearly as wide as the cephalothorax. The falces are nearly horizontal, divergent and rather long, with a short fang, and have no tooth on the inferior margin. The sternum is narrow and oblong, and is truncated in front. The first coxae are separated by the width of the labium, which is plainly longer than wide. There is a distinct pedicle. In the type species there is a constriction in the middle of the abdomen.

This genus is distinguished from *Quekettia* by its more ant-like shape and by the abdominal constriction, as well as by the difference in the spines. *Kima* and *Quekettia* differ from *Araegeus* E. S. which also has no tooth on the inferior margin of the falx, by the shape of the sternum, which in *Araegeus* has a long point in front.

KIMA AFRICANA, sp. nov.

A large, ant-like species, with long slender legs and a long pedicle.

♂. Length 8 mm. Legs 4132, fourth much the longest.

We have but one specimen. The cephalothorax is without hairs, the color being dark reddish brown, deepening to black on the cephalic plate. The fourth legs are black throughout their length, but the others, although black near the body, shade to brown at the extremities. They are equal in thickness and are but scantily haired. The first leg has three pairs of spines under the tibia, and two pairs under the metatarsus. The palpi are black. The rather high black clypeus has a few short white hairs. The abdomen, which has a construction in the middle, is covered with rich golden yellow hairs, which shade to white on the venter. The falces are reddish brown, and are flattened, with two teeth on the superior margin, at the distal end.

We have one male from Cape Colony, sent to us by Dr. Braun.

HYLLUS TRELEAVENII sp. nov.

♀. Length 13 mm. Legs $\overline{34}12$.

In our specimen the cephalothorax is rubbed almost bare, showing the integument to be dark red on the sides and lighter above. There seem to have been many light yellow and reddish hairs on the sides and over the back. Around the eyes of the first row and on the clypeus are long reddish hairs, and white hairs with a yellow tinge cover the front faces of the falces. The abdomen has a covering of short reddish-gray hairs with long white hairs scattered over it. Down the middle is a herringbone stripe of white, and a white band around the base is continued on the sides to the middle point, where it ends in a conspicuous somewhat triangular white spot. Further back, on each side, is a crescent-shaped white spot. The legs are all hairy, especially the first pair, which has long black and white hairs below. Their general color is dark, but the metatarsi and tarsi of the first legs, as well as the distal ends of the metatarsi and the whole of the tarsi of the third and fourth, are lighter colored.

We have a single female from Mashonaland sent by Mr. Guy A. K. Marshall. We have named the species for Mr. F. Treleaven of Cape Town.

CYLLOBELUS AUSTRALIS, sp. nov.

Near *Cyllobelus chionogaster* E. S. but smaller, and lacking the red hairs around the eyes, and red marks on the cephalothorax and abdomen.

♀. Length 5 mm. Legs 4132, fourth much the longest.

The cephalothorax is bronze-brown with a narrow white line running across the clypeus and entirely around the lower margin. The abdomen is bronze-brown with a large number of symmetrically disposed snow white spots. The two largest are somewhat triangular in shape and are placed on each side of the middle of the dorsum. There are smaller ones lower down on the sides, both before and behind these, and a single one just in front of the spinnerets. Six pairs of small white spots or lines extend from the base to just above the apex, over the middle of the dorsum. The underparts are of a dull silvery color. The falces are brown. The palpus is dark with a white spot on the patella and one on the tarsus. (In *chionogaster* the palpus is yellow with white spots). The legs are brown, the first pair having white marks on the patella and tarsus, and at the distal end of the tibia.

We have a single female sent to us by Dr. Braun from Algoa Bay, South Africa.

RHENE BANKSII, sp. nov.

♂. Length 4.5. Legs 1423, first plainly stoutest, with short fringe of hairs on under side of patella and tibia.

The cephalothorax is a little wider than long, and slants upward from the anterior eyes. The quadrangle is plainly wider behind than in front, is much wider than long, and occupies two-thirds of the cephalothorax, The anterior eyes form a straight row, and are close together, the middle being less than twice as large as the lateral. The second row is close to the first. The sternum is widest in the middle, pointed behind, and truncated in front. The anterior coxae are separated by barely the width of the labium, which is longer than wide. The falces are short, vertical and parallel.

The cephalothorax is dark with two white spots on the cephalic plate just in front of the dorsal eyes, and a curved white band on the front part. There is a white longitudinal line on the middle of the thoracic part, and a good many white hairs are seen on the sides. The abdomen is dark, with six white dots forming a curved line around the anterior end, and a transverse line of white dots in front of the middle of the dorsum. Near the posterior end is a large central white spot, from which a curved white line runs down on each side. There are some scattered white hairs on the clypeus. The first leg is dark with a short dark fringe under the patella and tibia, and a white spot at the distal end of the femur. The other legs have white rings at the ends of the joints, and are dark colored, excepting the tarsi and the proximal halves of the metatarsi, which are light.

We have a single male from Cape Town, sent by Dr. Braun.

NOTES. — Mr. William H. Ashmead's memoir on the Hymenoptera Parasitica of the Hawaiian Islands occupies pages 277–364 of vol. 1, part 3 of the Fauna Hawaiiensis and is illustrated by two uncolored plates. There are sections entitled : General considerations, Classification of the Hymenoptera, Systematic arrangement of the Hawaiian Hymenoptera, Distribution, Bibliographic, and Systematic account of the Hymenoptera Parasitica, the last forming the greater part of the text.

The descriptions are concise, yet sufficiently detailed ; a tabular separation of the species of each genus with more than a single representative is given in most instances.

One hundred and twenty-eight species are enumerated; those figured are new. Eleven genera only are considered peculiar to the Islands ; most of the species are new so that a statement as to their distribution can not be made ; of the known species, five are considered of Asiatic or Australian origin, seven of North American origin, and five of European origin.

The specification as to families, genera, and new species given on page 281 is not quite accurate, and that as to new species is not just to the author.

Mr. Ernest Hartet contributes to Novitates Zoologicae, vol. 8, no. 4, p. 494–506, an appreciative notice of the scientific work of the late William Doherty. A list of the papers based on Doherty's collections is given; also a list of seven articles on butterflies written by Doherty himself.

CORRECTION : — Page 304, col. 1, line 5 and line 14 for *second* read *first*.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Orthofidonia vestaliata Guen.

Egg. Elliptical, strongly flattened concave, one end considerably depressed, the other rounded bluntly, scarcely truncate. Pale yellow, shining; perfectly smooth, no sculpturing. Size .7 × .5 × .3 mm. Turned partly red before hatching.

Stage I. Head rounded, shining yellowish luteous, ocelli black. Body cylindrical normal, moderate, entirely smooth; pale yellow, not shining; shields undifferentiated, unmarked; feet moderate, normal. Later became all shining pale green, translucent, the food showing green in spots.

Stage II. Head rounded, yellowish luteous as before; width, .4 mm. Body the same shining translucent yellowish, the food green, irregularly spotted. Tubercles minute, dark, setae short. Segments slightly annulate.

Stage III. Head rounded, slightly bilobed, obliquely erect, clypeus high; pale yellow, not shining, mouth brown, eye black; width, .6 mm. Body normal, moderate; shining translucent pale green, appearing bright green from the food, immaculate. Tracheal line fine, white. Tubercles dark but very small. Setae small, black, pointed. Thorax and joints 10–13 slightly wrinkled annulate, 5 to 9 a little drawn out and smooth.

Stage IV. Head round, flattish before, rather wide, clypeus sunken; green, not shining; width, 1.05 mm. Body moderate, normal, green, the incisures narrowly folded whitish, tracheal line white; setae short, rather stiff, dark, from invisible tubercles. The larva is translucent, not transparent; no marks.

Stage V. Head round, flat before, nearly erect; green, a line of brown dots starts at the base of the clypeus and runs up to vertex of lobe, then curves inward and downward shortly; ocelli black, mouth brown; width, 1.6 mm. Body moderate, uniform, not tapering, cylindrical, normal; segments weakly 6-annulate. Smooth, rather shining translucent green, a whitish dorsal and a subdorsal line shaded between them and below with darker green; feet green; anal plate rounded, equalling the weakly shielded anal feet; shields membranous. Subventral fold rather brightly shaded in a faint paler tint. Dorsal stripe fainter and broader than the subdorsal one. Pupation in the ground.

Food plant. The larvae were fed on wild cherry.

Moths common early in June in the more densely wooded gulches in the lower foot hills of the Rocky Mountains near Denver, Colorado. Eggs June 7th, mature larvae, July 1st. Apparently single brooded.

PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

ARE THE MALLOPHAGA DEGENERATE PSOCIDS?

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIF.

In a paper published in 1896* I effectively concealed some remarks which I hoped might revive interest in a question that of late years has been allowed to drop into an undeserved innocuous desuetude. This question or problem concerns the phyletic relations of those insects which have been shuffled about by systematic entomologists more perhaps than any other insects, those namely that began as a great host forming the order Pseudo-Neuroptera, were later divided into smaller hosts ordinally classified as Pseudo-Neuroptera, Platyptera and Corrodentia, and which now are wholly freed from genealogical entanglements with each other by appearing in the text-books as a series of small orders, each present order corresponding to the families of the earlier catch-all orders. That my remarks had no attention was their deserved fate; deserved for allowing themselves to get into a too corpulent "new species" paper. Such papers are properly filed for reference, not read, and so my intention of giving the Psocidae the ill name of being the ancestors or the very immediate relatives of the ancestors of the biting bird lice (Mallophaga) got itself simply filed for reference.

But I did mean to ask seriously the question whether or not the Psocids and the Mallophaga are not more nearly related than their present classification would lead one to suspect; whether indeed they should not properly compose a single order readily separable into two sub-orders, but obviously linked by a common descent. And in the last five years I have, with the handling of many more Mallophaga, and the occasional re-examination of the Psocid body, had my notions only made more distinct, and my inclination to answer the question in favor of the common origin of the two groups only strengthened. And the reasons for this believing are outlined in the following paragraphs.

While recognizing clearly the occurrence among unrelated forms of "parallelism of development" and "parallelism of structure" there is yet a certain degree of similarity approaching identity, which, when reached, we can explain only on the basis of community of origin, and descent. This degree of approxi-

*New Mallophaga II, from land birds, together with an account of the Mallophagous mouthparts. Contrib. to Biol. from Hopkins Seaside Laboratory of Leland Stanford, Jr. University, No. VII, 117 pp. 14 plates, November, 1896.

mate identity is, of course, not determinable by arbitrary convention, nor, in the present state of zoological science, by quantitative measure, but its recognition is in most cases obvious to all naturalists, and the power to recognize parallelism when existing, and to recognize identity due to common origin and descent when existing is simply one of the required qualifications of the competent systematic zoologists. In my belief the Mallophaga and Psocidae possess in common certain peculiar and characteristic structural features (coupled with corresponding physiological features) whose practical identity must be ascribed to community of origin and which thus reveal a community of descent on the part of the insects themselves.

In my paper New Mallophaga II previously referred to, are described and illustrated in detail the mouthparts of four Mallophagous genera (pp. 431–457 plates LX–LXII). Three of these genera thus described, and ten other genera examined, although not described in detail, are found to possess a well-developed peculiar pharyngeal or oesophageal sclerite characteristically constant in position and shape, and of important use in the manipulation of the dry food (bitten off parts of feathers) of the insects. (In four of these genera there appear to be species lacking the sclerite — or, at least, having it in such weakly chitinized condition as to make it invisible when the undissected head of the specimen is examined.) In five Mallophagous genera this sclerite is absent. In the four remaining known genera of the order no specimens are at hand. This peculiar sclerite is a thickening of the chitinous intima of the pharynx, and appears as a bonnet-shaped sclerite lying on the ventral wall of the pharynx, with hollow part upward, with median groove closed behind, projecting processes at the interior angles, and a pair of long slender "bonnet string" pieces, which project dorsally and pass on either side of the pharynx, or oesophagus, upward and around it, and attach by their ends to the dorsal wall of the head. Opening into the median groove from its ventral side is a small duct, which, followed to its source, is seen to come from the union of a pair of ducts, each one of which comes from an oval gland lying ventral to the sclerite, and fitting into a concavity on the anterior end of a weakly chitinized, pedicel-like structure, which projects backward and is attached by a foot-shaped expansion to a large, strong muscle. (Figures of this oesophageal sclerite and glands are given on plate LXII in New Mallophaga, II.)

Apart from this peculiar addition to the usual biting insect mouth, two of the four genera of Mallophaga whose mouthparts were carefully studied were found to possess certain peculiar "forks" in the mouth, which by dissection are seen to be very small chitinous rods lying inside of the mouth above the labium whose posterior ends attach to the ventral wall of the head by muscles, and whose anterior ends are strongly forked or bifurcated and project through the ventral wall of the mouth thus lying free and uncovered in the mouth cavity. Although not observed in the other two genera of Mallophaga dissected, it is not at all certain that they are not present, their extreme minuteness and delicacy making their discovery a matter of difficulty. (Figures of these "forks" are given on plate LX, New Mallophaga, II.)

For the rest, the Mallophagous mouth is of simple biting type with a considerable reduction of the maxillae, the maxillary palpi being wholly wanting.

Thanks to Edward Burgess the anatomy of the mouth of the Psocidae has been known since 1878.* The unusual features, long familiar to entomologists as curious and unique structures, of the Psocid mouthparts are the so-called "forks" of the mouth and the so-called "oesophageal bone" and paired "lingual glands" of the pharynx. Burgess's description of one of the Psocid forks is as follows. "This is a slender, more or less curved chitinous rod with a forked bifid tip, and two or three times as long as the outer lobe. The distal portion of the fork, about one-third or less of its length, projects through the lining membrane of the mouth. At this point the fork is stoutest, and from it, it tapers to either end, the outer portion being stouter than the inner. The membrane where it is united with the fork is delicate and elastic, thus permitting the fork to be projected forward or drawn back at will. Within the head the fork is held in position by muscles inserted on its base, which unite it with the lobe and stripes of the maxilla, and by a ligament which runs backward to the top of the head." (Figures of the "forks" are given in Burgess's paper, and copied in plate LXIV of New Mallophaga, II.)

I have simply to add that the Psocid "forks" are in structure, position and attachments practically identical with the Mallophagous "forks," and whether Burgess's view that the forks are new and independent mouthparts, or Scudder's view that they are the modified maxillar laciniae, be true, the Mallophagous forks can readily be homologized with them, for the Mallophagous maxillae have but one terminal lobe and would be not at all sorry to find in the forks their lost laciniae!

Burgess's description of the "oesophageal bone" of the Psocidae is as follows: "Below the opening of the oesophagus lies a bone which may be fancifully likened to a lady's bonnet upside down; the high front lies along the oral cavity at about half way up; two narrow extensions, representing the bonnet strings, run forward and upward, embracing the oesophagous. The great bundles of short muscles filling the large vaulted clypeus are attached to the ends of these strings, and by their contraction close the oesophagus. Just below the front a fine duct opens which is the common duct of a pair of lingual glands.

*The anatomy of the head and the structure of the maxillae in the Psocidae. Proc. Bost. Soc. Nat. Hist., 1878, Vol. XIX, p. 291, pl. VIII.

These can be seen through the semi-transparent mentum and labium, offering an irregular, obovate outline. A short duct from the lower end of each gland leads into a common duct which opens in the oesophageal bone as already described. The ducts curve over the lower end of the glands and run up their posterior surface, to which they are soldered nearly to the top. The line of the ducts together with the lateral outlines, give the glands a three-cornered shape, somewhat like that of a butternut. A little triangular cup fits on the summit of each gland, and on it is inserted a suspensory muscle, the upper end of which is attached to the cranium." (Figures of "bone" and ducts are given in Burgess's paper and copied in plate LXIV of New Mallophaga II.)

I have again simply to add that the "oesophageal bone" and its accessory "lingual glands" of the Psocidae, are surely the "oesophageal sclerite" and its accessory glands of the Mallophaga.

The important thing about this correspondence between "forks" and oesophageal structures in the two groups is that the same structures do not occur elsewhere among insects.

Perhaps the most familiar Psocid form is the degenerate genus Atropos. It is very different from the winged forms; in fact it is the "link" that connects the winged Psocidae with the Mallophaga. In Atropos as in the Mallophaga there are no traces of wings; the whole body, head, thorax, and abdomen is flattened exactly as in the Mallophaga; the meso-thoracic and meta-thoracic segments are fused to form a single segment, one of the characteristic structural conditions of the Mallophaga, while the great development of the clypeus and the restriction of the mouthparts to the ventral aspect of the head, so characteristic of the bird-lice, is quite as characteristic of this degraded Psocid. So too the peculiar condition of the labrum in the Mallophaga lying as it does on the ventral aspect of the produced clypeus finds an identical repetition in Atropos. The mandibles of Atropos present a really striking similarity with those of the Amblycerous group of the Mallophaga, the details of teeth, condyles, facets and musculation being extraordinary alike.

The internal anatomy of the Psocids has yet to be worked out in detail, although Nitzsch, in 1821, described the alimentary canal and the reproductive organs of *Clothilla pulsatoria* (a degraded wingless form much like Atropos). He found the alimentary canal to be very simple, without special crop or proventriculus, and with a simple elongate stomach consisting of a sac-like anterior part and a longer tubular posterior part. There are four Malpighian tubules. The intestine is very short, its rectal portion being as long as all the rest of it. The ovaries consist of five egg-tubes on each side; connected with the oviduct there is a peculiar accessory gland consisting of a sac containing other small sacs each with an elongate efferent duct, the number of these secondary sacs varying from one to four according to the individual. The testis is a simple capsule; connected with the base of the jaculatory duct there is a pair of elongate accessory glands or vesiculae seminales.

The internal anatomy of the Mallophaga has been described by Grosse (for the species "*Tetrophthalmus chilensis*" = *Menopon titan*), by Nusbaum, and latest and in most detail by Snodgrass,* who studied comparatively the various organs in several species. With reference to the alimentary canal, Malpighian tubules and reproductive organs (the only organs which have been described for the Psocidae and can therefore be compared, with the similar Mallophagous organs), Snodgrass finds that the alimentary canal in the Mallophaga presents two types, one being "simple, having no special development at any part" and possessed by the Amblycera, (one of the two sub-orders into which I have divided the Mallophaga) the other "complicated by a lateral and backward prolongation of the crop so that the latter forms a large expanded diverticulum of the oesophagus." This second type is possessed by all the members of the sub-order Ischnocera. In the simple type the canal corresponds thoroughly well with that of Clothilla, even to the shortness of the intestine as compared with the rectum. With regard to the Malpighian tubules Snodgrass finds their number constant throughout the Mallophaga. That number is four, as in Clothilla. Finally comparing the reproductive organs Snodgrass finds the number of egg tubes to be five in the suborder Ischnocera and to vary from three to five in the Amblycera. In Clothilla there are five. In the Mallophaga the testes are either two or three in number on a side and there is a pair of seminavesicles, with its two members either distinct or more or less fused. In Clothilla there is one testis on a side, and a pair of seminal vesicles.

So far as the comparison can be made then it is obvious that a great similarity in character of internal organs exists in the degraded wingless Psocid Clothilla, and the Mallophaga.

Finally it is interesting to note the similar habits of Atropos, Clothilla and the other dust-lice or book-lice (including all the degenerate wingless Psocids) and the biting bird lice or Mallophaga. These book-lice feed on dry dead organic matter, such as wood and paper, dried insects and dried bird and mammal skins; the Mallophaga feed exclusively on the dry dead dermal scales, hairs and feathers of mammals and birds. I have found Atropos often in the nests of birds; was it feeding on the feathers there? What a simple step from the feathers off the bird to the feathers on the bird! Then Atropos would be a bird-louse and a new and rather aberrant genus of Mallophaga! As a matter of fact in collections of Mallophaga sent in to me, all the specimens presumably collected from the bodies of birds, I have in a few, (very few, truly,) instances received specimens of Atropos.

* Snodgrass, R. E., The Anatomy of the Mallophaga, in New Mallophaga III, Contrib. to Biol. from the Hopkins Seaside Laboratory of Leland Stanford Jr. University, no. XIX, pp. 224, plates 17 plates.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Euchlaena paectinria Den. & Schiff. The mature larva has been described by Packard.

Egg. Elliptical, narrower in one diameter as usual, one side a little straighter than the other, giving a suggestion of reniform shape; micropylar end roundedly truncate, the other not depressed. Reticulations roundedly elevated but with sharply angular crests, regularly hexagonal, some perfect hexagons, the cell areas forming shallow pits; reticulations large, uniform all over; pores at the angles in raised whitish cones, absent on the under side. Size 1 × .6 × .5 mm. Later turned sordid pearly pink.

Stage I. Head rounded, oblique, free, dull grayish luteous, a faint darker band on the side. Body moderate, normal, rather slender, smooth; gray white, a broad straight, even, purple brown subdorsal band, a little diffusely spreading to joint 2, the pair conjoined into a single dorsal band on joints 10–13. A similarly colored broad ventral band, widened a little on the segments, coloring the feet of joints 10 and 13 in a line; thoracic feet pale. Tubercles and setae small, dark, obscure. Larvae active and wild.

Stage II. Head rounded, bilobed, erect, whitish, mottled with brownish over the lobes; width .5 mm. Body grayish white, the broad, dark brown, subdorsal bands joining behind as before; ventral band supplemented by subventral segmentary blotches, diffusely forming a line. Feet pale outwardly. The Subdorsal band is divergently triplicate on joint 2. Tubercles and setae minute.

Stage III. Head round, erect, gray, streaked with darker dots especially in two lines on each lobe; width .8 mm. Body moderate, gray, blotched with lighter subventrally, suggesting diamond-shaped markings and lighter along the subventral fold. No distinct marks, only traces of paler lines, rather numerous, fine, the more distinct one a geminate dorsal, somewhat confusedly blotched. Setae minute.

Stage IV. Head rounded, well bilobed, broad, gray brown, two-thirds of the clypeus and a triangular space on each side of it black edged and trisected by the black clypeal sutures; rest of head mottled in dark, especially in three, broad, parallel vertical bands, obscurely geminate; width 1.3 mm. Body moderate, normal, the tubercles slightly elevated and the segments subannulate posteriorly. Dark gray, faintly longitudinally lined in pale; very faint darker subdorsal band and blackish dashes anteriorly on the segments above the pale subventral fold; joints 10 to 13 more heavily black shaded. No well defined marks. Tubercles blackish, setae short; feet concolorous. Anal plate large; a pair of short anal prongs. A distinct short collared elevation appears on joint 5.

Stage V. Head rounded, slightly bilobed, large, full, oblique; whitish, all the vertex covered with pale gray, mottled blotches, leaving a little white at the sides only; a broadly low triangular white space, edged with black above, trisected by the clypeal sutures; epistoma gray; antennae moderate, incurved; width 2 mm. Body moderate, the central segments not quite twice as long as wide; a dorsal rounded elevation on joint 5 composed of two contiguous ellipses bearing tubercle ii of each side; ii of joint 11 on a smaller and sharper, but similar elevation. Anal plates rather large, rounded triangular; a pair of subanal prongs. Else smooth, tubercles scarcely elevated, black. Bark gray, mottled in ill-defined shades of cinereous and reddish; reddish dorsally with traces of whitish subdorsal and lateral lines, the posterior parts of segments annulate and grayer; subventral fold pale with black dashes above anteriorly on the segments; venter with several irregular, geminate, crinkled, black lines, subtesselate blotched posteriorly on the segments; whitish orange shading at the spiracle especially on joints 5 and 6. Feet gray; spiracles black rimmed; setae normal, short, ia to ib separate, iv stigmatal posterior, vii of three in a triangle subventrally, not much scattered. Cocoon a fairly close web of brown silk.

Food plant. The larvae were fed on wild cherry.

Eggs from a ♀ taken at Pine Grove, Colorado. Eggs July 10th, mature larvae August 10th, the moth again August 20th.

A NEW CATOLACCUS ON *SITOTROGA CEREALELLA* OLIV.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

The following new Pteromalid was bred at the U. S. Department of Agriculture from infested specimens of *Sitotroga cerealella* Oliv., taken by Mr. Dunwoody, in Philadelphia.

Catolaccus cerealellae, sp. nov.

♀.— Length 2 to 2.5 mm. Metallic bronze green, closely punctate and sparsely pubescent. The abdomen is conic-ovate and usually but not always a little longer than the head and thorax united the two or three basal segments tinged with cupreous, the segments subequal in length with some very delicate transverse aciculations.

The legs are metallic green, the knees, tibiae and tarsi, except the last joint, the scape of the antennae and the labial palpi being honey-yellow; the maxillary palpi and the rest of the antennae are dark fuscous; the flagellum is very slightly and gradually thickened towards apex, the ring-joints annular, the first joint of funicle being usually a little longer than the pedicel or as long, the following joints very gradually shortening to the club, the last being obtrapezoidal in outline, a little wider at base than at apex; the joints of the club, or at least the first two, are wider than long. The head is transverse, wider than the thorax or about 3½ times as wide as thick antero-posteriorly, thinnest at the middle. Wings hyaline, the veins light-brown or brownish yellow. The metathorax is impressed on each side posteriorly with usually a short delicate median carina on the middle lobe at base.

The male measures scarcely 2 mm. in length, bronzed black, the flagellum being filiform and densely hairy, while the abdomen has a yellow median spot basally and is oblong-oval, not pointed at apex.

Type.— Cat. No. 6115, U. S. N. M.

Hab.— Philadelphia.

Host.— Lepid. *Sitotroga cerealella* Oliv.

SOME INSECTS OF THE HUDSONIAN ZONE IN NEW MEXICO.— VIII.

COMPILED BY T. D. A. COCKERELL.

DIPTERA.

The species here listed were collected on the top of the Las Vegas range at the end of June, 1901. The determinations are wholly by Mr. Coquillett; the other matter is by Mr. Cockerell.

Species new to the fauna of New Mexico are marked with an asterisk. Comparing the present list with Coquillett's list of the Diptera of Alaska (Pr. Wash. Ac. Sci., 1900), we note that the faunae are very similar. Twelve of our species have been actually taken in Alaska, while several others are represented there by allied forms. The greatest points of difference are: (1.) that we have four of the larger Tachinidae, including three of *Peleteria*, a genus not given in the Alaska list; (2.) that we have four Trypetidae, the Alaska list showing only one.

* *Ptychoptera lenis*, O. S. Also Colorado.

Simulium ochraceum, Walker. North to Alaska, and down to the Middle Sonoran Zone (Mesilla Valley). Its presence at the lower levels is doubtless due to the migration of swarms.

* *Tabanus sonomensis*, O. S. North to Alaska.

* *Anthrax catulina*, Coq. There are no Bombylidae in the Alaska list. 38 species of this family are known from New Mexico, and of these 19 belong to *Anthrax*.

Cyrtopogon callipedilus, Lw. West to Sierra Nevada.

* *Empis triangula*, Coq. North to Alaska. Discovered by the Harriman Expedition.

* *Cheilosia hoodiana*, Bigot.

* *Cheilosia occidentalis*, Will. At Beulah, N. M. (Canadian Zone), the genus is represented by *C. tristis*, Lw.

Syrphus arcuatus, Fall. N. to Alaska

* *Syrphus intrudens*, O. S. Described from the coast range of California, but very close to *S. amalopis* from the White Mts., N. H.

* *Sphaerophoria sulphuripes*, Thoms. N. to Alaska.

* *Sphaerophoria melanosa*, Will. W. to California.

* *Eristalis obscurus*, Lw. N. to Alaska.

* *Myopa clausa*, Lw. N. E. to Maine.

* *Panzeria radicum*, Fb. N. to Alaska. Also at Beulah, N. M.

Gonia capitata, DeG. Down to Mesilla Valley. Also European.

Peleteria aenea, Staeger. A northern type.

Peleteria tessellata, Fabr. Northern and European.

Peleteria robusta, Wied. Down to Mesilla. N. to Canada.

* *Cordylura vittipes*, Lw. N. to Alaska.

* *Tephritis platyptera*, Lw. N. E. to Connecticut.

Tephritis genalis, Thoms. W. to California; down to Mesilla, N. M.

Urellia abstersa, Lw. Down to Mesilla Valley; also in Cuba, etc.

* *Urellia mevarna*, Walk. S. E. to Florida.

Sepsis violacea, Meig. Down to Mesilla Valley.

* *Piophila casei*, L. N. to Alaska. It would seem that this insect must be native in America.

* *Scatella stagnalis*, Fall. N. to Alaska.

* *Oscinis carbonaria*, Lw. N. to Alaska.

* *Meromyza americana* Fitch. Also at Beulah, N. M.

* *Borborus equinus*, Fall. Also European.

* *Borborus geniculatus*, Macq.

LEPIDOPTERA.

The following species, obtained on the top of Las Vegas range at the end of June, 1901, have been kindly identified by Dr. H. G. Dyar.

Anarta melanopa, Thunb. Also Labrador, etc.

Drasteria erechtea, Cram.

Chorizagrotis agrestis, Grote.

Choreutis occidentella, Dyar. Also found in Alaska.

Platyptilia cosmodactyla, Hbn. This is the species referred to in PSYCHE, Nov., 1901, p. 272. Extends to Alaska and Europe.

Pyrausta generosa, G. & R. (?)

HYMENOPTERA, MYRMICIDAE.

The following ants were taken on the top of the Las Vegas range at the end of June, 1901, and have been kindly determined by Prof. W. M. Wheeler.

Myrmica brevinodis, Emery. Worker. "Smaller and darker than those from New England."

Leptothorax canadensis, Provancher. worker and dealated ♀. Does not differ from specimens which Prof. Wheeler has from Wis., Pa., and Conn.

Both of these species are new to the fauna of New Mexico.*

CEPHALIC MORPHOLOGY. Comstock and Kochi have lately given us an important paper (Amer. Nat., 1902, vol. 36, p. 13–45, 29 figs.) upon the morphology of the insect head, and the cephalic sclerites at length assume a deeper significance and a new interest.

In this paper, the view that the head consists of seven segments is adopted and ably supported. The areas of the skull are reviewed and several sclerites hitherto disregarded are described and aptly named.

The morphology of the thoracic segments is discussed so far as is necessary to determine the structure of a typical segment, as the basis for an interpretation of the head, and then the cephalic sclerites are homologized with the thoracic ones, and the endoskeleton of the head with that of the thorax.

The presentation of the subject is logical and clear. The argument rests, of course, upon the assumption that homologies between the cephalic and the thoracic sclerites exist. If, however, the differentiation of the thoracic sclerites has been only an incidental mechanical result of strains, due to the

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* I will take this opportunity to record the following ants, also new to New Mexico, kindly determined by Prof. Wheeler: — *Camponotus maculatus vicinus*, Mayr, Trout Spring, Gallinas Cañon (Transition Zone); *Formica sanguinea rubicunda*, Em., Trout Spring; *Liometopum microcephalum occidentale*, Emery, Romeroville (Upper Sonoran Zone); *Eciton californicum*, Mayr, Las Vegas; *Stenamma fulvum aquia*, Buckl. Trout Spring; *Brachymyrmex heeri depilis*, Em., Trout Spring; *Cremastogaster punctulata*, Em., Las Vegas and Las Vegas Hot Springs; *C. lineolata*, subsp. *coarctata* var. *mormonum*, Em., Romeroville.— T. D. A. C.

wing muscles (and this view has much to support it), then no close agreement of cephalic and thoracic sclerites may be expected. Granting the assumption, however, the arguments are impressive.

These authors have been the first to make any extensive examination of the skull in the light of embryology, and their creditable efforts will pave the way toward the true conception of the morphology of the skull.

ANOTHER NOTE ON DELTOCEPHALUS MELSHEIMERII.

BY C. F. BAKER, STANFORD UNIVERSITY, CALIF.

Since there can be no more important work in taxonomy than the accurate determination of types, I feel inclined to add still another note to the discussion concerning this species. Mr. Gillette's voluminous remarks in Vol. 9, No. 299 of this Journal are both interesting and important. But he meets the old objections by the discussion of new propositions and leaves wholly out of consideration that point on which my whole argument was based. Both *minimus* and *affinis* have been well described; further argument as to their distinctness does not clear up our difficulty.

As it appears to me, the whole question is this: Where is the type of *Melsheimerii?* Some of Fitch's specimens are in Albany, some in the Nat'l Museum. In each place is a "type" of this species. It becomes a question as to which specimens the species was based on.

At the time I discussed the matter in print the point was made that the size of the species as given in the original description agreed with the Natl. Museum type and precluded the possibility of its being *affinis*. My series of *affinis* contained a lot of specimens from all parts of the country and I could not find a true "Melsheimerii" in the lot. Mr. Gillette's study is very incomplete because it does not also include a report on the Natl. Museum "type." His failure to do this leaves the matter standing in essentially the same light as before the publication of his article. The comparison of the two types — the vital point in the whole discussion has yet to be made.

For the same reasons Mr. Gillette's remarks as to Chlorotettix are wholly invalidated. I hope he will give us a supplementary report on the really essential points at issue, with the necessary evidence in hand and set the matter finally and forever at rest.

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NOTES ON THE LARVAE OF SOME TEXAN DIPTERA.*

BY CHARLES THOMAS BRUES, AUSTIN, TEX.

During the past winter I obtained the light yellow silken nest of a spider, which instead of the usual quota of eggs or young spiders, contained a mass of small yellow hymenopterous cocoons and a number of white grubs of various sizes which I supposed to be the larvae of the hymenopteron. Some of the latter soon pupated however, and later emerged, when they proved to belong to a species of the dipteron genus *Phora*, which seems to be undescribed. From the hymenopterous cocoons appeared specimens of *Pimpla annulipes* Brullé.† Some young spiders from a similar nest were kindly identified by Mr. Nathan Banks as belonging to the genus *Epeira*.

So far as I can ascertain no other species of Phora is known to be parasitic on spiders eggs. Some species live upon dead insects or snails, others in decaying vegetable matter, while a few are internal parasites of other insects.‡ There can be no doubt that the Phoras were primary parasites of the spiders eggs and not secondary ones living in the *Pimpla* larvae, as the *Phora* larvae of all sizes were free, the smaller ones evidently failing to mature from lack of food, only two spider eggs remaining from the whole nestful. This is thus not a case of true parasitism accompanied by degeneration, but a condition where a predatory instinct and a considerable power defence must be possessed by the larva to enable it successfully to live and develop in the midst of a nest full of young spiders, voracious often to cannibalism.

The following is the description of the new species of Phora.

PHORA EPEIRAE, sp. nov.

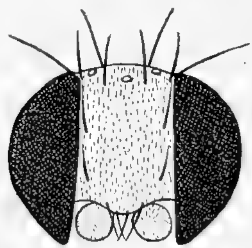
Length, 3–3.5 mm. Rather broad and stout, almost wholly yellow. Abdomen quadrimaculate. Face shining, delicately punctulate, with a lateral row of four bristles: the vertex with four bristles, arranged at the

* Contributions from the Zoological Laboratory of the University of Texas. No. 29.

† Spiders' eggs seem to be the customary hosts of the various species of *Pimpla*. Howard, in an interesting paper on the hymenopterous parasites of spiders (Proc. Ent. Soc. of Washington, Vol. II, No. 3, p. 290) mentions three other American species of *Pimpla* which infest the cocoons of Epeirid spiders.

‡ For a complete list of the European species with their food-habits see Brauer, Systematische Studien der Dipteren-Larven. Denkschriften der mathematisch-naturwissenschaftlichen Classe der k. Akademie der Wissenschaften Wien. Bd. 47 p. 66. 1883.

corners of a square, between the lateral rows; lower edge of the face at the middle with a row of four downwardly directed and smaller bristles. Antennae luteous, except the third segment of the arista which is black. Palpi yellow. Post ocular cilia stout, black, the lowest three or four which are below the eye being stout, and twice as long as the others. Thorax yellow, paler below and brownish above, except for a rather wide lighter dorsal vitta; with a few lateral black hairs and two stout macrochaetae behind each wing. Scutellum with 2 marginal macrochaetae. Abdomen yellow; first and second segments each with a large quadrate, very sharply defined lateral black spot (that on the second absent in one specimen). The spots on the first segment each bear a tuft of small black bristles at the middle. Ovipositor black at extreme base. Legs yellow, each coxa with a few stout bristles at the apex, together forming a stiff backwardly directed brush. Femora wholly pale, the posterior ones deeper yellow. Tibiae, especially the posterior pair, spinulose above; four posterior tibiae with a single apical spur, that of the middle leg very long, half as long as the tibia. The posterior tibiae have a fine black line above, their tarsi bilineate with black externally. Wings light yellow, faintly dusky at the tips. Costal vein very much thickened on its basal half, its spines moderate: second longitudinal vein bifurcate, the furcation and the tip of the costal vein forming the apex of a low isosceles triangle. Four equally distinct discal longitudinal veins.



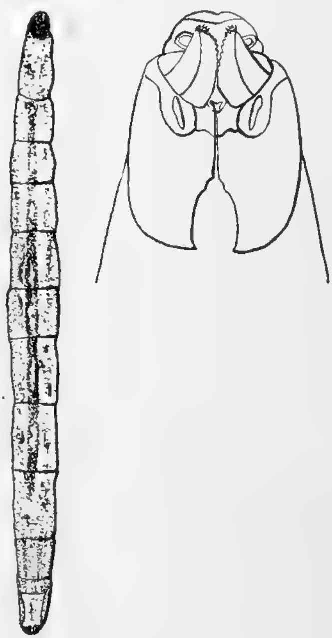
Phora epierae Brues. Head, frontal view.

Described from four female specimens, Austin, Tex.

This species may be readily distinguished from P. scalaris Loew., by the coloration, and from the European P. interrupta Ztt., by the spinulose hind tibiae. The maculation of the abdomen will distinguish it from any known North American species.

Neoglaphyroptera opima Lw. (?)

Larva. Length 15 mm., greatest width 1.30 mm. Body elongate, tapering at both ends; the constrictions between the body segments



Neoglaphyroptera opima Lw (?) Larva and head of larva, ventral view.

not well marked. Color uniformly yellowish white, except where the internal organs produce a grayish tint owing to the transparency of the integument. Head black, shining, oblong, but little narrowed in front; about one-half longer than wide. The posterior margin above is acutely emarginate. The occipital lines slightly convergent posteriorly, more strongly near their coalescence, which is at the angle of the posterior emargination. Antennae rudimentary, extending but little above the surface of the head; the cavities at their bases large and distinct. Ocelli absent. Labrum prominent, the fleshy part emarginate in front; the horny, basal part pectinate along the inne margin, the teeth slender and curved. Mandibles subtriangular, regularly serrate along the inner margin, otherwise without teeth or protuberances. Body smooth, entirely without hairs or spines. First thoracic segment nearly as long as the following, after which the segments increase in length, the anal one being equal to the head and first thoracic segment together. Body much contracted in the anal segment, although the integument is not so sharply constricted. The rudiments of the compound eyes of the imago are distinctly seen as two dark oval discs near the surface of the dorsal sclerite of the first thoracic segment, directly above the imaginal discs of the first pair of legs.

Pupa. Length 7.5 mm. Entire body nearly white with the stigmata black.

Several nearly grown larvae of this species were found under the bark of a fallen oak log. They soon pupated and one of them which was allowed to transform, emerged after a pupal stage of only fifty hours duration. The larvae spin a delicate web in which they lie suspended and move about under the bark. They are so extremely delicate that the web is necessary to prevent them from being dried up from contact with the dry bark. At times the larva moves its head towards the web and apparently eats the strands as it glides along. After pupation it lies half suspended in the web, which adheres to the integument wherever it touches.

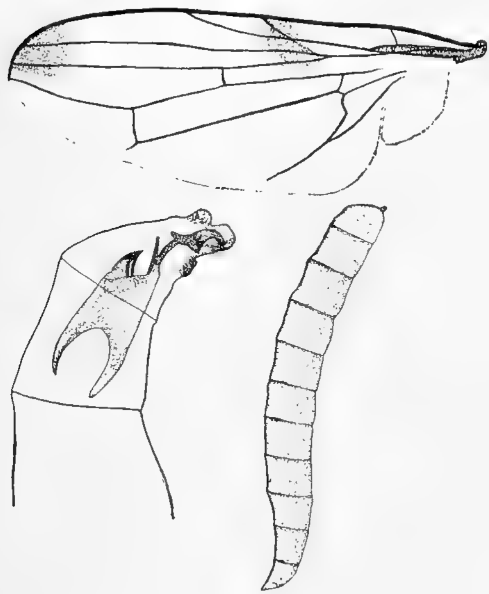
Euxesta nitidiventris Lw.

A very large number of fully grown larvae which proved to belong to this species were found beneath the bark of a dead pecan tree (*Carya pecan*) during the month of January. They were clustered together in groups of a hundred or more individuals, their bodies adhering together on account of their very sticky consistency. The greater number of the larvae were seen at a distance of five or six feet above the surface of the ground. Their habitat is like to that of one of the European Ortalinae, *Psairoptera*, which has been found under the bark of pine trees. (Zetterstedt, Diptera Scandinaviae, VI, p. 2265.)

Larva. Length 4–6 mm. Body composed of eleven segments, narrow and somewhat pointed anteriorly, gradually enlarged posteriorly, the apex rounded. Mouth parts very retractile, the hooks separated. Head nearly as long as the first two thoracic segments together. Body segments without any distinct ambulatorial projections, the segments being only slightly produced ventrally at the margins. The anal segment bears two subdorsal papillae on the sides of which the stigmata are situated.

The larval habits of this species are quite different from those of the closely related E. notata, Wied. which was bred by Riley from larvae found in the pulp of an osage orange. The larva of an European genus of Ulidinae which has been described by Brauer (loc. cit.), is quite similar to that of Euxesta.

The imagines which I bred do not agree very well with Loew's description of *E. nitidiventris*, yet seem undoubtedly



Euxesta nitidiventris Lw. Wing, larva and head of larva, showing mouth-parts.

to belong to the same species. I therefore append a description of both sexes in their fully mature state.

Male. Length 3.5–4 mm., of wing 3.25–3.50 mm. Dark shining metallic blue, vertex blue, front brown. Antennae red brown, arista, dorsal and apical part of third joint blackened. Face at antennae with a white transverse pollinose stripe, blue below; cheeks white pollinose. Thorax and abdomen dark shining metallic blue. All the coxae brown, anterior and posterior ones slightly blackened. Anterior legs black except basal two thirds of first tarsal joint. Middle and posterior legs black, with knees yellow and tibiae brownish on inner side, first joint of tarsi also yellow. Wings hyaline, with an apical dark spot extending slightly beyond the third longitudinal vein, also a median spot at tip of auxiliary vein extending to a little beyond the third vein.

Female. Differs from Loew's description as follows: femora metallic blue, often brownish tinged. Knees yellowish, tibiae brownish black, tarsi black except first joint.

Pseudopyrellia cornicina Fabr.

During the month of December, while collecting insects in cow dung, I unearthed several remarkable dipterous larvae of a brilliant blue color. On the evening of the same day they began rapidly to lose their brilliancy and pupated during the following night. After several weeks they emerged and proved to be specimens of the common Muscid fly, Pseudopyrellia cornicina Fabr. I am at a loss to account for such a bright color in this Muscid larva, living concealed from view during its entire life, as all or very nearly all other larva which feed upon cow dung are colorless or of a somber brownish color.

THE STRUCTURE OF THE NESTS OF SOME NORTH AMERICAN SPECIES OF FORMICA.

BY HERMAN MUCKERMANN, S. J., PRAIRIE DU CHIEN, WIS.

A few years have elapsed since Professor Auguste Forel made a myrmecological tour through some of the eastern states. A short synopsis of his results was communicated by him from Faisons, N. C., to the Belgian Entomological Society, Brussels. In the very beginning of this report, which is doubly valuable, emanating as it does from the pen of a man so thoroughly acquainted with European ant-nests, Prof. Forel expresses his astonishment at the remarkable and characteristic structure of the nests in America. "In North America," he says, "with some rare exceptions, the ants do not construct mounds, either of masonry or of other materials." (Psyche vol. 9, No. 304–305, p. 231.)

The purpose of the following remarks is both to prove by new facts this well-founded statement and to modify it with reference to southwestern Wisconsin. The facts presented will serve at the same time to illustrate in accordance with local circumstances his interesting "theory of domes."

For the sake of clearness I propose first to examine the *exterior structure* of the nests and then to pass over to their *interior arrangement*.

In the first place, to avoid misunderstandings, we must be on our guard, lest by an American "ant-hill" we understand something similar to what is meant by Forel and Wasmann when speaking of the ant-hills of Switzerland or Holland. To say the least, ant-hills in this country never have a height and circumference approaching any of those of Europe. I remember well myself to have seen in western Germany, for instance in the Eifel and in Munsterania, ant-hills reaching a height of 1 m. Besides, there can be no question concerning the fact that the less conspicuous ant-hills of America do not even occur as frequently as they may be found, for instance, in the fir plantations of southern Holland. Still it would be a decided exaggeration to apply to this region the remarks of Forel concerning the eastern states. "When conversing with them (Americans) they refer to it (ant-hill) as a great rarity which can be found in such and such a forest twenty or thirty miles away" (*l. c.* p. 231). Here within a radius of five miles I know of at least one hundred so-called ant-hills. The reason for this may be found in the circumstance that hereabouts the ants are subject to less disturbance. In any case, it remains an established fact that ant-hills are far less numerous here than in Europe.

The ant which really erects regular hills is precisely a species not occurring in the east, as Forel justly remarks, namely *Formica obscuripes* For. It is one of the most ferocious ants to be found here and to it alone may be applied his remarks concerning *Formica integra* Nyl. in the east, namely that like the European *F. pratensis*, it "rises upon its hind legs, curves the abdomen and ejects . . . . some venom while in this position" (*l. c.* 233). According to my experience the ejection of formic acid is so copious, as to force the observer to retire momentarily, especially during the main breeding season. Of these ants I know at least 35 nests in this neighborhood. All without exception consist of elevated conical mounds, whose shape is more or less modified according to its age and the number of inmates. I had occasion to observe the nests as well in their inception as in the different stages of their development. In founding a new colony this species, unlike many of its relatives, does not choose a shady spot; on the contrary, the favorite situation of *F. obscuripes* is in the middle of an open meadow, on some exposed railroad embankment, in fine, wherever the sun pours down its full measure of heat. The little squadron sallying forth to establish a new foundation no sooner discover a warm, sunny place, than they begin to dig a few holes in the soil, whence there arises gradually a little hill. At the same time straws, small twigs, dry blades of grass, and the like are zealously gathered by the indefatigable workers and, mixed with earth, are heaped on the hill. If the number of workers is considerable there arises within a short time a domelike structure of variable dimensions up to 75 cm. in diameter and 40 cm. in height, bearing a resemblance to some of the famous Indian mounds abounding in this region. Still the nest has not yet its characteristic form, which seems to prove the most advantageous both for the adult individuals and especially for the undeveloped brood. The entrances are concentrated more and more in the central part of the dome surface. This surface is at first somewhat flattened, later on even hollowed out, so that under favorable circumstances the outer slopes of the hill appear entirely abandoned, so much so as to allow grass to cover them. Thereby, however, the nest is enclosed, as it were, by a massive rampart which proves an excellent protection against the extreme changes of temperature. By the same means, moreover, the ants succeed in hiding their nests to some degree, especially in spring time, when the new generation is being developed. Thus it may happen, that at this season the nests which are otherwise so conspicuous, may elude even a careful search. Of course in summer, after the grass is burned up by the sun, they are all the more noticeable. But at that time the ants are compelled by the excess of heat and want of humidity to retire to the lower compartments and ordinarily appear again only after a rain and on moderately warm days. Generally speaking, the main working season of our ants is in the early springtime. During summer and autumn they are found only in the early morning hours and often not even then. Spring is also the only season in which we can count with certainty on securing guests of ants without extra trouble. Later in the year success is very doubtful, unless one happens, for instance, to strike the exact time when some of them, as *Xenodusa cava* Lec., effect a change of hosts.

Formica exsectoides For., easily recognizable by its shining abdomen and slightly concave occiput, is the second species which builds its formicary in the shape of a hill. But these hills are usually much lower and flatter. In any case they never approach in shape the truncated cones of *F. obscuripes*. Nor is there to be noticed so great a regularity in their structure. They sometimes resemble heaps of dirt dumped out at random. Besides, they consist for the most part of earth, although the latter is often mixed with vegetable remains. A favorite location of their nests seems to be some clearing in the brushwood. At least I found several nests on such spots and when, owing to frequent disturbances on my part, the ants preferred to change their domicile, they established their new dwelling in a precisely similar situation. The nest entrances are distributed without any apparent order. At any rate, they are not located merely "at the base and about the periphery." *Formica exsectoides* is one of the ants most frequently met with in this region, and often their colonies consist also here of ten and more nests.*

Whereas the two preceding species habitually build hills, they are to be found rarely or not at all with the following species. Thus they are rather rare with *Formica rubicunda* Em. and *Formica dakotensis* Em. The cause of this may be partly ascribed to their slaves, which generally do not construct real mounds. Of the two species just mentioned *F. rubicunda*, which may be easily recognized by its subsericea-abdomen, with almost unvarying constancy builds within and around the stumps of trees, which then present the following appearance. The remains of some sturdy oak are still standing firmly in the ground and are surrounded by leaves, twigs, etc. Merely a few entrances, which happen to exist in the trunk itself or have been constructed through the sod near the roots, establish communication with the interior. In such cases the use of explosives is almost unavoidable in order to lay bare the inner sanctum. Now and then the nests built by *rubicunda* are exceedingly similar to those of *F. subsericea*. This happens whenever the superior number of slaves exerts a greater influence on the structure of the nest. *Formica dakotensis*, on the contrary, finds its home usually under some flat stones and mostly so, as far as I could observe, when they have slaves. In the latter circumstances the nest presents the appearance as if two different "architects" had "evolved the plan." It is half

*By the way, Forel maintains to have ascertained that "unlike the exsecta of Europe these ants have not the instinct to seize their enemies by the neck in order to saw it apart." According to my observation the analogy with their European congeners is complete also in this particular, so far as southwestern Wisconsin is concerned.

dakotensis, half *subsericea*. For the rest, if *F. dakotensis* has no slaves, it builds mounds often bearing a deceptive resemblance to those of *F. exsectoides*, as also at least their workers have some similarity with those of the latter, with the exception that their appearance is more delicate, the head being rounder, smaller and with less concavity of the occiput. Here too the slaves are, at least so far as may be determined from seven instances, in an inverse proportion to the number of the "lords."

The greatest irregularity of nest structure is to be noticed with *F. subsericea* Say, the auxiliary of *F. rubicunda* and *F. dakotensis*, active, fleet-footed, but cowardly, at least if alone. Yet notwithstanding the great variety, four principal kinds of nest structure may be distinguished. Passing along the edge of a forest, our attention may be suddenly arrested by a bare spot in the grass. At the same time there are to be noticed a number of apertures, through which the somewhat silky inmates effect an incredibly sudden retreat. This is one of their usual methods of nest construction. Another method not less characteristic is the one utilized now and then in the mixed colonies of *F. rubicunda* ⌓ *subsericea* and *dakotensis* ⌓ *subsericea*. On some slight elevation along the road arises an oblong, moderately sized hillock, topped by a piece of rock or a branch of a tree. The numerous entrances of the nest are all situated under this protecting roof, where during May and June may be found the queens and cocoons which, however, disappear with marvellous rapidity upon the removal of their guardian portal. Moreover, mounds may be perceived here and there, but neither as large nor of the same shape as those of *F. obscuripes* and *F. exsectoides*. Finally, small colonies generally hide their establishments beneath stones.

Whilst the subsericea-nests, at least hereabouts, are never found in decaying logs, these are precisely the habitations of *Formica subaenescens* Em., so called from the appearance of its abdomen. When enslaved by *Polyergus bicolor* Wasm., which in consequence of its sickle-shaped mandibles is unable to excavate, they entirely determine the structure of the latter's nest. Yet it is not without interest to notice that these nests, as will be mentioned later on, with regard to some species of Camponotus, Larius, Stenamma etc., are in communication with the earth, whither their inmates retire during the extremes of cold and heat. Concerning the rather insignificant structures of the other five species occurring in this region, namely *F. pergandei* Em., *F. nitidiventris* Em., *F. fuscata* Em., *F. schaufussi* Mayr and *F. incerta* Em., it may suffice to remark, that they usually occur at the edge of fields or on hillsides, being ground nests and having their entrances under stones and logs.

In comparison, therefore, with the ants of Europe the exterior structure of American formicaries is somewhat insignificant, so that Forel justly avoided calling them "mounds," at least as a general thing. But far different is the case with regard to the *inner structure*, which, *ceteris paribus*, is much more considerable. Wasmann defines a formicary as an "irregular aggregation of chambers and tunnels serving as the abode of ants and their brood and connected by different apertures with the outside world." * To characterize our ant-nests the following qualifications might be added to the above definition. In the first place, American nests descend to a relatively great depth. The part covered by fragments of woody material is but a small fraction of the dome. It is only in the case of *F. obscuripes*, that now and then not only the dome but also a considerable part of the nest itself consists of the above mentioned material. Below the dome the nest assumes gradually larger dimensions, until at a depth of 1.50 m. it often reaches a diameter of 2 m. and beyond. In a nest of *F. rubicunda* I found a few days before the first vernal oviposition ants in considerable numbers only at the depth of 1 m., a queen only at 1.25 m.† I had to penetrate to a like depth in the case of *F. exsectoides* and others. I examined one nest of *F. exsectoides* during November, when the ants had already retired to their winter quarters. Several hours were consumed in digging. After having reached a depth of 2 m., I decided to desist. Most of the ants were found singly. Many were lying with their legs extended and embedded in the cold earth. It was only in the tunnels, which often follow the course of the roots, that we found clumps of ants as they are to be seen during winter in observation nests. One queen alone was captured; and yet it is well known that queens of *F. exsectoides* abound. Since we were concerned with a very populous nest, the principal part of it was necessarily still deeper down. Another peculiarity is to be found in the tunnels. Towards the surface they are highly concentrated; soon they separate further and further and being now horizontal now vertical, they penetrate into all parts of the nest. In the nest just mentioned, as also in some others, there were found at the depth of 1.50 m. directly below the dome only four irregular tunnels within a square meter.

A third characteristic feature, finally, is the preference manifested by the ants for stony locations. It is true that this is owing more to the character of the soil. But in virtue of their well developed faculty of adaptation, which is only a manifestation of their plastic instinct, these ants have been enabled to utilize this circumstance in an appropriate manner. For, the stones not only mean a great saving of work for the ants, but also impart great solidity to their structures. Moreover, they facilitate the regulation of temperature during spring, and in winter and summer such a rocky abode affords the best protection against

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* E. Wasmann, S. J. Vergleichende Studien ueber das, Seelenleben der Ameisen und der hoeheren Tiere. 2. Aufl. p. 67.

† Of course during the time of oviposition ♀s and ☿s may be found directly below the nest's surface.

heat and cold. To mention only one instance, a layer of 1 m. of stones and other hard material had to be penetrated, before reaching the real nest of *F. rubicunda*, which we examined carefully, and it was only at that depth in a sandy layer that the ants were found in greater abundance. The case was similar in nests of *F. exsectoides*, *F. dakotensis* and others.

Thus Prof. Forel's statement mentioned above has been found applicable also to this region. Besides it seems to be evident that the structure of more extensive domes is rendered useless by the extreme range of temperature varying from $-20°$ F. to $+110°$ F. (resp. $+150°$ F. in the sun). For the development of the offspring the heat is sufficient even without domes, and during the warmest and coldest months such a dome would be uninhabitable. The theory that the nests of ants "abound above all on hill-slopes facing the east" (l. c. p. 232) has not been confirmed by my experience. For here ant-hills abound on eastern and western slopes alike.

NOTES. GALLS. — The large number of excellent photographic plates make Connold's British vegetable galls (New York: E. P. Dutton & Co., 1902, xii, 312 pp., 13 plates. 27 text figures) a work of considerable scientific interest. With their aid the abnormalities classified as galls, with the exception of those found on oak, that are common in Great Britain can be determined, and the identity or affinity of the British galls to those of North America especially commends the book to American students.

The text, in addition to faulty arrangement, contains many obscure and inaccurate statements.

GENERA INSECTORUM. — The scope of this work, which is due to the enterprise of Wytsman of Brussels, is shown by the first and second fascicules issued some months ago. In the first fascicule Régimbart deals with the Gyrinidae one of the most sharply defined families of the Coleoptera; he recognizes three tribes, nine genera, and 363 species. There are brief statements regarding the distribution, habitat, and characters of the family; analytical tables for the separation of the tribes and genera with more detailed characterization of the genera and lists of the species with the distribution of each. The plate, which is excellent, gives many structural details.

In the second fascicule Kieffer considers the Evaniidae, another easily distinguished family; the handling is similar to that of Régimbart though more open to criticism in some minor details; three subfamilies, nine genera, and 269 species are recognized.

Foeninae, *nom. nov.* is not tenable, Foenus Fab. (1798) being a synonym of Gasteruption Latr. (1796). Ashmead State Board of Agric., U. S. A. Catal. Ins. is not a very clear citation for Smith's List of New Jersey insects.

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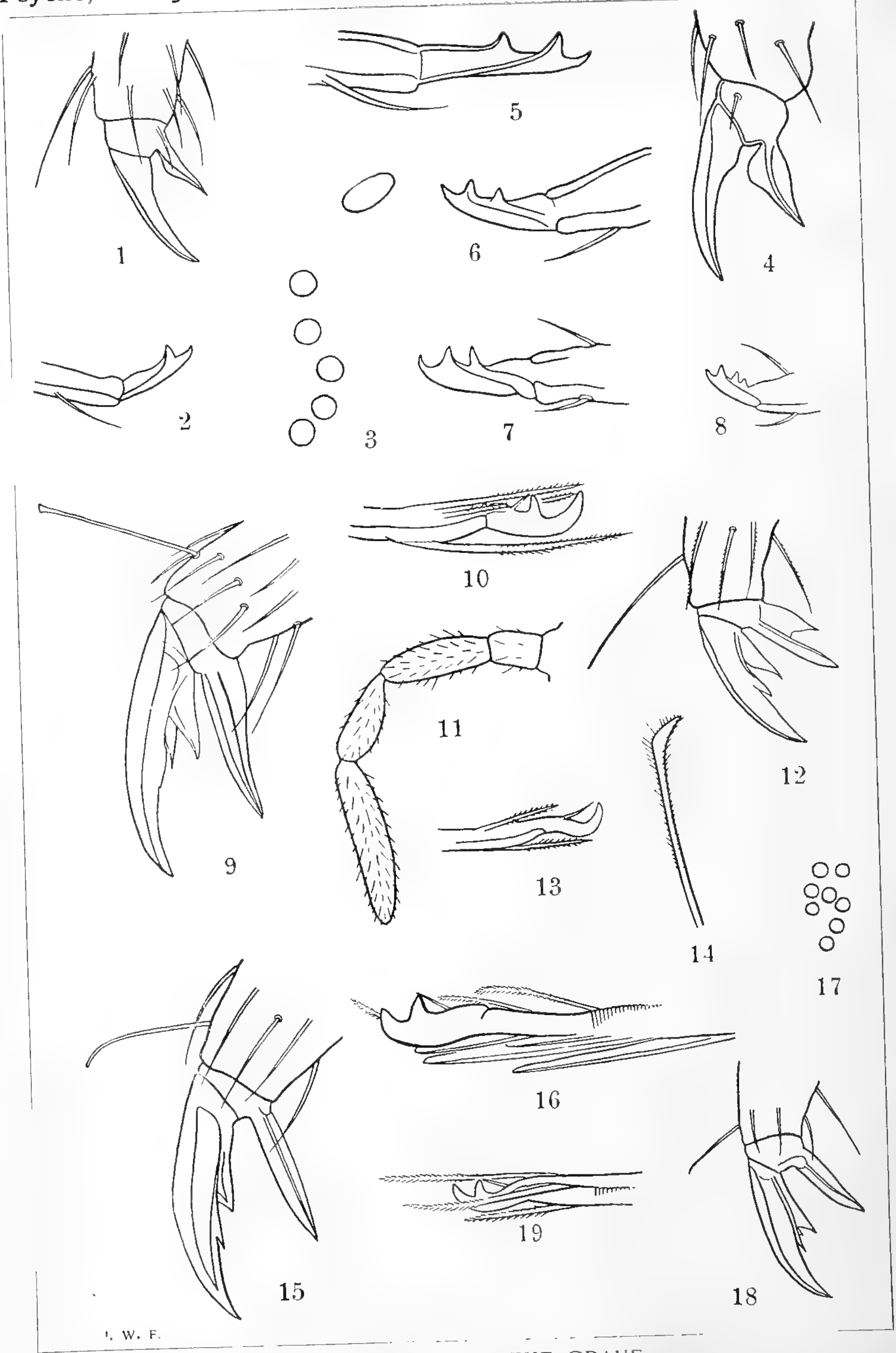

COLLEMBOLA OF THE GRAVE.

Explanation of Plate 4.

Fig.	1.	Isotoma fimetaria (L.) Tull.	Left aspect of right front foot, x 810.
"	2.	" " " "	Left aspect of right mucro, x 810.
"	3.	" sepulcralis, sp. nov.	Eyes and postantennal organ of right side, x 570.
"	4.	" " " "	Right aspect of right hind foot, x 680.
"	5.	" " " "	Left aspect of right mucro, typical, x 810
"	6.	" " " "	Mucro, common variation, x 810.
"	7.	" " " "	Right mucro, rare variation, x 680.
"	8.	" " " "	Right mucro, one case, x 585.
"	9.	Entomobrya lucifuga, sp. nov.	Left aspect of left hind foot, x 810.
"	10.	" " " "	Mucro, x 810.
"	11.	Sinella tenebricosa, sp. nov.	Antenna, x 154.
"	12.	" " " "	Right aspect of left hind foot, x 810.
"	13.	" " " "	Left aspect of right mucro, x 810.
"	14.	" " " "	Clavate seta from head, x 810.
"	15.	Pseudosinella argentea, sp.nov.	Right aspect of left hind foot, x 1089.
"	16.	" " " "	Right aspect of left mucro, x 1089.
"	17.	" candida, sp. nov.	Eyes of right side, x 405.
"	18.	" " " "	Right aspect of left hind foot, x 810.
"	19.	" " " "	Right aspect of right mucro, x 810.

PSYCHE.

COLLEMBOLA OF THE GRAVE.

BY JUSTUS WATSON FOLSOM, CHAMPAIGN, ILL.

This article deals with the Collembola collected from graves in Washington, D. C., by Dr. Murray Galt Motter and recorded in his important paper * on the fauna of the grave.

I am indebted to Dr. Motter and Dr. Howard for the opportunity to examine this material.

In over fifty-six hundred specimens there were only six species, five of which are new. Ninety-seven per cent consisted of Isotoma sepulcralis, sp. nov., two per cent of Entomobrya lucifuga, n. sp. and the four other species were represented by only thirty-three examples in all.

The comparison of my results with those tabulated by Dr. Motter shows that, as regards the period of interment, Collembola (usually I. sepulcralis) occurred with practically every cadaver from No. 1 (1 yr. 11 mos.) to No. 81 (16 yrs. 5 mos.), and one specimen was found with No. 95 (21 yrs.). In fact, Collembola occurred almost always when the surroundings were in any degree moist, and almost never in a dry environment; in the two cases (Nos. 14 and 95) in which they were present in spite of dryness, there were only three individuals altogether. Nos. 82–100 were all marked as "dry" and none of them afforded any collembolans except No. 95, just mentioned. From these insects, then, no conclusion of any medico-legal importance appeared,— simply a few facts of entomological interest.

The most striking characteristics of these subterranean forms are those that may be attributed to the absence of light: all are white — without pigment — and are blind, with the exception of two species, which, of course, have a black ocular pigment. In one of these, the eyes even vary slightly in number. All these species have the chief peculiarities of cave insects. The blind Isotoma fimetaria is known, the world over,

* M. G. Motter. A contribution to the study of the fauna of the grave. A study of one hundred and fifty disinterments, with some additional experimental observations. Journ. N. Y. Ent. Soc., vol. 6 (1898), pp. 201-231.

as a soil insect and several blind species of Sinella and Pseudosinella, especially the latter, have been found in Europe and America, confined to caves or living under stones and in other dark places. The two species here described as having eyes are doubtless not restricted to dark situations.

For each species I give the numbers used by Dr. Motter to designate particular specimens in the Stiles-Motter collection of grave fauna, deposited in the U. S. National Museum. Each of these numbers is followed by another in parentheses that expresses an approximate estimate of the number of individuals.

No. 46 I did not have, and I did have [8(2), 9(11), some that do not appear in the table already referred to. These are Nos. 51 (5 individuals), 105 (3), 112 (7), 123 (9), 143 (2), 151 (2), 153 (15), 156 (3), 178 (6), 187 (500), 223 (15), 399 (1), 408 (50), 414 (2).

Isotoma fimetaria (L.) Tull.

1761. *Podura fimetaria* Linnaeus, Fauna Svecica, ed. 2.

1872. *Isotoma fimetaria* Tullberg, Sveriges Podurider, p. 48, taf. 9, figs. 32–33.

Figures 1–2.

White. Eyes absent. Postantennal organs ovate or oval. Antennae slightly longer than the head, with segments as 6: 9: 9: 17; first two segments cylindrical, third dilated apically, fourth elliptico-cylindrical. Superior claws (fig. 1) smoothly tapering, scarcely curving, untoothed; inferior claws half as long, lanceolate, acuminate; hind claws largest; one unknobbed tenent hair. Abdomen feebly dilated with third and fourth segments subequal. Furcula as long as the head, borne by the antepenultimate segment and not attaining the ventral tube (extending two thirds as far); dentes two and one half times the manubrium in length, slender, tapering; mucrones (fig. 2) elongate, subequally bidentate; apical tooth scarcely hooked, second erect; proximal two thirds of mucro suboblong. Numerous stiff setae on head, body, and appendages; several long erect setae in a row across the middle of each abdominal segment; many long stiff setae at the apex of the abdomen. Length, .87 mm.

This is one of the best known species of its order and is a cosmopolitan insect. It is essentially a soil species, often occurring about the roots of plants.

Five specimens: 153 (3), 151 (2).

Isotoma sepulcralis, sp. nov.

Figures 3–8.

White. Eyes (fig. 3) normally ten, sometimes eight. Postantennal organs broadly elliptical, oval or ovate. Antennae subequal to the head in length; segments stout, as 6: 10: 9: 19; third segment dilating distally, fourth elliptico-cylindrical. Body elongate cylindrical. Superior claws (fig. 4) uniformly curving and tapering, untoothed; inferior claws extending two thirds as far, ovate-lanceolate, acuminate, with stout midrib; front claws smallest, the other pairs successively larger; tenent hairs absent. Fourth abdominal segment one third longer than the preceding one and bearing the furcula. Furcula short, extending but half way to the ventral tube, strongly tapering; manubrium and dentes subequal in length; mucrones (fig. 5) one third as long as dentes, elongate, subequally tridentate ; apical tooth sharp, feebly hooked or, rarely, falcate ; second conical, erect ; third a trifle smaller than second, erect or else slightly inclined caudad, situated midway on the mucro and laterad of the other teeth. The mucrones vary considerably in minor details as shown in figures 6–8 ; in one case, the third tooth was absent on the left mucro but present on the right one, and in a single instance the proximal tooth was doubled on both mucrones (fig. 8). Clothing of numerous short appressed setae, which are restricted to the middle half of each segment, leaving the anterior and posterior fourths of the segment bare ; longer, stiff setae at the apex of the abdomen ; short stiff bristles on antennae and legs ; short curving setae on the urcula with a few long erect ones. Maximum length, 1.8 mm.

This species is quite distinct from any hitherto described. It formed ninety-seven per cent of all the specimens examined.

Over 5400 types: 2 (600), 4 (45), 12 (15), 13 (33), 14 (200), 15 (100), 75 (1), 100 (300), 101 (79), 164 (5), 182 (75), 184 (100), 186 (200), 187 (500), 188 (8), 193 (150), 195 (24), 201 (20), 204 (1), 223 (15), 231 (60), 243 (17), 245 (14), 248 (1), 259 (50), 270 (200), 308 (1), 324 (21), 331 (1), 332 (100), 347 (8), 356 (4), 357 (25), 362 (300), 380 (4), 383 (1), 390 (50), 394 (2000), 407 (70), 408 (50), 422 (1), 429 (86). Type No. 6144, U. S. National Museum.

Entomobrya lucifuga, sp. nov.

Figures 9–10.

White. Eyes absent. Antennae twice as long as the head, or more than half as long as the body, with cylindrical segments, related as 11 : 16 : 18 : 26. Mesonotum concealing the pronotum. Superior claws (fig. 9) broad, curving, with a pair of large triangular basal lamellae and beyond these an obsolete tooth ; inferior claws extending three fourths as far, lanceolate, acute with sinuate outer margin ; hind claws largest ; one short tenent hair with a small knob. Abdomen dilated ; fourth segment four times as long as the third. Furcula attaining the ventral tube ; dentes half as long again as the manubrium ; mucrones (fig. 10) long, falcate, the second tooth equidistant from base and apex and the basal spine strong ; two barbellate dental setae attain the apex of the mucro and a third one exceeds it considerably. Stout clavate barbellate setae are found on the first two antennal segments and the coxae, are profuse on the head, meso- and metanotum, and occur, constantly diminishing in number, on the middle of each succeeding segment. Simple barbellate setae occur densely on the appendages and the apex of the abdomen ; the furcula bears many suberect clavate barbellate setae. Maximum length, 1.7 mm.

One hundred and thirty-one types : 7 (30), 8 (2), 9 (11), 10 (3), 17 (1), 18 (6), 105 (3), 112 (7), 123 (9), 143 (2), 151 (1), 153 (12), 156 (2), 178 (4), 219 (12), 229 (1), 237b (2), 288 (1), 331 (4), 356 (3), 358 (4), 363 (2), 366 (5), 383 (1), 399 (1), 414 (1), 422 (1). Type No. 6145, U. S. National Museum.

Sinella tenebricosa, sp. nov.

Figures 11–14.

White. Eyes absent. Antennae (fig. 11) half as long again as the head, with segments as 3 : 6 : 5 : 11 ; third segment subclavate, fourth elliptical. Prothorax exposed. Superior claws (fig. 12) broad, almost straight, with a long tooth in the middle and a long subtriangular acuminate basal lamella ; front pair of superior claws two thirds as long as the others; inferior claws three fifths the length of the superiors on the front feet and three fourths on the others, straight, broadly linear, acute, with a large ovate acuminate lamella on the basal half of the outer margin; one unknobbed tenent hair. Abdomen dilated; fourth segment two and one half times the third in length. Furcula attaining the ventral tube; dentes a little longer than manubrium; mucrones (fig. 13) simple, falcate, with a long curving basal spine that attains the apex of the mucro. Sparse short curving bristles on head and body; many stiff barbellate setae on the appendages; a few erect barbellate setae on the first two antennal segments and on the legs; stout clavate barbellate setae (fig. 14) occur on the vertex, coxae, meso- and metanotum and the last three abdominal segments. Length, .9 mm.

S. tenebricosa is closely allied to the European S. höfti Schäf.,* from which it differs chiefly in the claws.

Twenty-four types: 10 (15), 51 (5), 178 (2), 229 (1), 383 (1). Type No. 6146, U. S. National Museum.

Pseudosinella argentea, sp. nov.

Figures 15–16.

White. Eyes absent. Antennae one and one half times as long as the head and half the length of the body, with segments related as 5 : 10 : 11 : 17; third segment clavate, fourth elliptico-cylindrical. Thorax arched; mesonotum almost as long as the head and concealing the pronotum. Superior claws (fig. 15) stout, apically curving, unequally tridentate, the two proximal teeth being side by side; inferior claws two thirds as long on hind pair, and half as long on the other feet, broadly linear, acute; tenent hair small, unknobbed. Abdomen moderately dilated; fourth segment three times as long as the third. Furcula extending beyond the ventral tube; manubrium and dentes subequal in length; mucrones (fig. 16) basally suboblong with two subequal teeth and a long basal spine that attains the apex of the proximal tooth. Large rounded scales on head, body, and the under side of the furcula; dense stiff setae on antennae and legs; a dense cluster of stout rigid setae on the anterior border of the mesonotum and a few such setae above the antennae; dense short curving feathered setae occur at the apex of the abdomen and on the upper surface of the furcula. Length, 1.25 mm.

This new species differs as to claws and mucrones from P. cavernarum Moniez * (Tullbergia immaculata Lie-P. †) and P. virei Abs., ‡ its nearest allies.

A unique type, No. 156. Type No 6147, U. S. National Museum.

Pseudosinella candida, sp. nov.

Figures 17–19.

White. Eyes (fig. 17) sixteen; a black interocular V-shaped mark sometimes occurs. Antennae one and one fourth times as long as the head, with segments as 6 : 10 : 10 : 22; basal ring one fourth as long as the first seg-

* C. Schäffer. Die Collembola der Umgebung von Hamburg und benachbarter Gebiete. Mitth. Naturh. Mus. Hamburg, bd. 13 (1896), pp. 147–216, taf. 1–4. See pp. 192–193; taf. 4, figs. 103–105.

* R. Moniez. Espèces nouvelles de Thysanoures trouvées dans la grotte de Dargilan. Rev. biol. nord France, t. 6 (1893), pp. 81–86. See pp. 84–85.

† O. J. Lie-Pettersen. Norges Collembola. Bergens mus. Aarb. 1896, no. 8, 24 pp., 2 pls. See pp. 15–16, pl. 2, figs. 1–4.

‡ K. Absolon. Uebereinige theils neue Collembolen aus den Höhlen Frankreichs und des südlichen Karstes. Zool. Anz., bd. 24 (1901), pp. 82–90, 10 figs. See pp. 87–88, figs. 6–8.

ment; second segment subclavate, third clavate, fourth elliptico-cylindrical. Mesonotum concealing the pronotum. Superior claws (fig. 18) broad, curving, with a large proximal tooth and a small sharp distal tooth; between these there is, on the hind feet, another minute tooth; inferior claws over half as long as the superiors, oblong-lanceolate; tenent hair small and unknobbed. Fourth abdominal segment nearly four times as long as the third. Furcula attaining the ventral tube; manubrium and dentes subequal; mucrones (fig. 19) subfalcate with two subequal teeth and a prominent basal spine; three barbellate setae surround the mucro and two of them extend far beyond it. Scales large and rounded. A few minute setae occur on the head, stiff bristles on the appendages and curving feathered setae on the dorsal side of the furcula. Length, 1 mm.

This species bears much resemblance to P. alba Pack.* In alba, however, the proximal tooth of the superior claw is more basal than in candida, while the fourth abdominal segment is only three times as long as the third, and dense clavate setae are present on mesonotum, coxae, and the apex of the abdomen; alba, moreover, has only four eyes.

Three types: 268 (2), 308 (1). Type No. 6148, U. S. National Museum.

FURTHER NOTES ON NEW ENGLAND FORMICIDÆ.

BY GEO. B. KING, LAWRENCE, MASS.

Last summer Mr. C. Abbott Davis of Providence, Rhode Island, collected with other insects, such species of ants as he found, and later turned them over to me for study. The following is a list of the species taken with localities. The first fifteen are from Rhode Island.

Tapinoma sessile Say. Providence
Formica fusca L. Lonsdale
Formica fusca var. subsericea Say. Providence
Formica rufa subsp. integra Nyl. Providence & Kingston
Formica pallidefulva Latr. *subsp. schaufussi* Mayr. Providence
Formica lasioides Em. Providence
Formica gagates Latr. Providence
Camponotus herculeanus Latr. *subsp. ligniperdus* Latr. Providence
Camponotus marginatus Latr. *var. nearcticus* Em. Providence
Lasius americanus Em. Providence
Lasius claviger Rog. Providence
Cremastogaster lineolata Say. Lonsdale
Myrmica rubra Buck. *var. schencki* Em. Providence
Myrmica rubra Buck. *subsp. scabrinodis* Nyl. Kingston
Monomorium minutum Mayr. *var. minimum* Buckl. Providence.

Three species taken in Vermont.

Aphaenogaster fulva Rog. Bay, Vermont
Leptothorax canadense Prov. Western Vt.
Camponotus maculatus Fabr. *subsp. vicinus* Mayr. Bay, Vt., and the following at Lynn, Mass.

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* See C. Schäffer. Ueber württembergische Collembola, Jahres. ver. vaterl. Naturk. Württemberg, bd. 56 (1900) pp. 245-280, taf. 6. See pp. 269-270.

Camponotus herculeanus Latr. *var. pictus* For.
Formica fusca L. *subpolita* Mayr.
Lasius nigra. L.

The collection consisted of 22 species, of one of which there was not sufficient material for determination, but apparently it is distinct from any species hitherto found in New England.

THE SO-CALLED MANDIBLES OF SPIDERS.

BY WILLIAM A. RILEY, ITHACA, N. Y.

Regarding the homologies of the first pair of appendages of the arachnids there has always been a question. According to the prevailing view they correspond to the mandibles of insects and are therefore generally referred to as mandibles. The evidence indicates that this application of the term is incorrect.

In 1816 Savigny expressed himself against any attempt to homologize the head appendages of the arachnids with those of insects. He believed that in arachnids the first pair of appendages, commonly known as mandibles, in reality represented a modified pair of legs.

A little later Latreille, '29, advanced the view that the so-called mandibles are, in fact, the homologues of the second antennae of Crustacea. He stated that this is evident from a comparison with the second antennae of Crustacea and especially with those of the order Poecilopodes (*Limulus.*) As indicative of this homology he introduced the term *chelicerae,* (Gr. *chēlē,* claw + *keras,* horn), or *antennes-pinces.*

Following Latreille a number of prominent zoologists have referred to the chelicerae as homologous with the antennae of crustaceans and insects. Thus, Siebold, '48, says "This view of Latreille is the correct one, since the nerves of those organs do not arise from the abdominal ganglia, but directly from the brain, as those of the antennae of Crustacea and Insecta." Ed. Burnett, '54, p. 374. Blackwell, '52, while admitting, as highly probable, this homology, proposes as more non-committal the term *falces* instead of Latreille's term *chelicerae.*

While drawing most of their evidence from the Crustacea these authors have uniformly spoken of the appendages in question as corresponding to the antennae of insects. Thus, Simon, '92, p. 29, states that the first antennae of Crustacea are not represented in the arachnids and insects but that the second antennae find their homologues in the antennae of insects and the chelicerae of arachnids.

Those who hold to the view expressed by Simon have fallen into the error of assuming the homology of the antennae of Crustacea and of Hexapoda. But, as Viallanes and others have shown, the evidence of both comparative anatomy and embryology, clearly indicates that the antennae of the Hexapoda are the homologues, not of the *second*, but of the *first* antennae or *antennules* of the Crustacea. This is evidenced by the fact that the antennae of insects and the first antennae of Crustacea are innervated by the deutocerebral ganglia while the second antennae of Crustacea are innervated by the tritocerebral ganglia. The question then is as to whether Latreille was correct in regarding the chelicerae as homologous with the second antennae of Crustacea.

The evidence at hand leaves little doubt as to the correctness of this view. It is supported not only by comparative morphology but by physiological and embryological data.

Although physiological evidence may be of doubtful value as a criterion for determining homology it is interesting to note that, as pointed out by St. Remy, the first antennae are primarily olfactory organs while the chelicerae, like the second antennae, are primarily tactile organs.

From the embryological side the most striking evidence has been the discovery, by several investigators, of evanescent appendages lying in front of the rudiments of the chelicerae. The most definite account of these vestigeal antennae is that of Jaworowski, '91, who discovered them in the embryos of *Trochosa singoriensis*.

Latreille's theory has been assailed by Balfour, '80, and others on the ground that the ganglia of the chelicerae are primitively suboesophageal, like those of the mandibles of insects and that they only secondarily pass forward to unite with the supraoesophageal ganglia. This argument loses weight when we consider the fact that the ganglia of both pairs of *antennae* were primitively postoral in position. Indeed, Pelseneer, '85, has shown that even in the *adult* of Apus, a phyllopod, the second antennae are innervated by suboesophageal ganglia. Moreover, the studies of Balfour antedate the establishment of the existence, in insects, of a premandibular segment corresponding to the second antennae and having its ganglia at first postoral.

A more serious objection has been urged by Viallanes, '93, who believes that the chelicerae are the homologues of the first antennae. He states that in the adult arachnids the cerebral segment innervating the chelicerae has its commissure entirely preoesophageal and that therefore it cannot be homologous with the tritocerebral or second antennal. As bearing on this argument it is interesting to note that Janet, 99, regards the postoesophageal commissure as a compound of fibers from the three primitive commissures of the proto-, deuto-, and tritocerebral ganglia. The argument of Viallanes can also be met by the evidence that both pairs of antennae were primitively postoral in position. If in the crustaceans and insects the deutocerebrum has become entirely preoesophageal, why may we not have in arachnids a condition in which even the tritocerebrum has assumed this position? Indeed, the acceptance of Jaworowski's work as demonstrating the presence of vestiges of true first antennae leaves us no other alternative.

The evidence therefore goes to show that while in the insects the first pair of antennae is retained throughout life, in the arachnids it is the second pair which is represented by the chelicerae. In both groups the missing pair may be present in the form of embryonic vestiges.

Works Cited.

1816. Savigny, J. C. Mémoires sur les animaux sans vertèbres.

1829. Latreille, P. A. Les crustacés, les arachnides et les insectes.

1848. von Siebold, C. Th. Lehrbuch der vergleichenden Anatomie der wirbellosen Thiere.

1852. Blackwall, J. Experiments and observations on the poison of animals of the order Araneida. Trans. Linn. Soc. XXI.

1880. Balfour, F. M. Notes on the development of the Araneina. Quart. Journ. Micr. Sci. XX.

1885. Pelseneer, P. Observations on the nervous system of Apus. Quart. Journ. Micr. Sci. XXV.

1891. Jaworowski, A. Uber die Extremitäten bei den Embryonen der Arachniden und Insecten. Zool. Anz. XIV.

1892. Simon, E. Histoire naturelle des Araignées. I.

1893. Viallanes, H. Études histologiques et organologiques sur les centres nerveux et les organes des sens des animaux articulés. 6e Mémoire. Ann. Sci. Nat. Zool. (8) XIV.

1899. Janet, C. Sur les nerfs céphaliques, les corpora allata et le tentorium de la fourmi (*Myrmica rubra* L.). Mem. Soc. zool. France, XII.

GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — I.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Some years since I announced as in preparation a Student's Manual of North American Butterflies, north of Mexico, and a fragment of the same was published in 1892 (Proc. Amer. Acad. Arts Sci., XXVII) under the title, The tropical faunal element of our southern Nymphalinae systematically treated. Owing to other demands upon my time progress upon this Manual has been very slow, and I am now compelled to abandon the project. Such few portions as are in any way complete, mostly written ten years or more ago, I bring together in the following series of papers, in the hope that their publication may be of some service to the student who may undertake the task I abandon. It is only in the first two subfamilies that genera and species are considered, and I have therefore adopted for this collection of fragments the title given above.

Subfamily EUPLOEINAE.

Butterfly: Palpi stout, tufted with hairs. Antennae naked, arcuate, the club drooping, tolerably well marked. Fore legs of both sexes excessively atrophied, short and nearly naked. Fore wings long but ample; none of the nervures swollen at the base; internal nervure present; discal cell of hind wings long and closed by an interrupted vein; costal nervure terminating at middle of costal border. Abdomen unusually long and slender, the males with anal tufts of protrusile hairs. Colors of wings generally massive and generally very similar above and beneath. *Egg*: Sugarloaf shaped, considerably higher than broad, truncate and scarcely rounded at base, with slight vertical ribs and small cells at the outer borders of the crown. *Caterpillar at birth:* Head no larger than segments following. Body cylindrical, uniform, unicolorous; ranged appendages simple tapering hairs usually shorter than the segments.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Endropia duaria Guenée.

Egg. Laid loose, rolling. Elliptical with only traces of the side flattenings and end truncation, smooth, somewhat like hens eggs though more evenly alike at the two ends. Reticulations absent, represented only by the angle pores which are arranged in fine hexagonal pattern and look like light dots in the shadows. All pale yellow. Size .9 × .55 mm. They turned bright red in a day or two and black before hatching.

Stage I. Head rounded, erect, free; sooty brown black, the clypeus, a little dot each side and epistoma white; width .4 mm. Body moderate, normal with rounded wing-like elevations laterally on joints 5 to 9. Purple black with five dotted, transverse intersegmental white bands on joints 5 to 9 anteriorly, cut by narrow dorsal and lateral lines of the ground color; a few whitish dots on joint 13 anteriorly. Bands narrowed to obsolescence ventrally; feet dark.

Stage II. Head vinous brown, a bright white spot in the clypeus, two on each side, one on base of antennae, base of labium and a small geminate one on face of lobe; width .6 mm. Body, robust, a little inflated centrally, a round prominence, bearing tubercle iv, most distinct on joints 5 and 6. Ground color sordid brown, mottled and faintly longitudinally lined in darker and with streaks of pale dottings; two oblique white spots subdorsally anteriorly on the segments, one before the dark vinous spot covering tubercle iv, elongate and obscurely trilobed; ventral streaking irregularly brightened into nearly white. Tubercles and setae obscure.

Stage III. Head rounded, squarish, broad, lobes full at vertex, flat before, erect. White, heavily black mottled over lobes, leaving a white space at vertex and near clypeus; sutures dark, epistoma brownish; width 1.1 mm. Body normal, rather thick, the area of tubercle iv slightly cushiony elevated. Purplish brown, tubercles iv and vii dark velvety brown; addorsal, subdorsal, lateral, substigmatal and subventral narrow, faint, dotted, white lines; two obliquely placed, round, slightly elevated white spots subdorsally anteriorly on joints 5 to 7, one on 8. Lateral anterior white patch of four subconfluent elevated spots between the black tubercle iv and the front edge of the segment on joints 5 to 8. A rounded, elevated, unpaired, dorsal prominence on joint 12; sides of 13 whitish. Feet pale, the thoracic of joint 4 and the abdominal ones, especially those of joint 13 black marked. Tubercles and setae small, black. Venter doubly, obliquely, dark streaked, forming a broad lattice work in diamond shape.

Stage IV. Head rounded, disk-like, flat before, a broad margin all around, flattened and shallowly notched at vertex. Face mottled with large, subconfluent, white spots, separated by black dottings and with an irregular black rim; sides and vertex gray, of brown mottlings on a whitish ground; width 1.8 mm. Body nearly cylindrical, smooth, the dark spot at tubercle iv scarcely elevated. Gray, the spot at iv dark brown on joints 5 to 10; venter lighter with irregular dotting, suggesting a diamond pattern. Dorsum finely lined and marbled with blackish on a grayer ground, the bright white dots two subdorsal and two above, a streak below the stigmatal region, both anterior, conspicuous on joint 6, smaller and partly absent on the other segments. Tubercles in black spots; setae very short, pale brown. Ground color luteous gray, the area about the dark tubercles i lighter, looking tessellated.

Stage V. Head rounded, somewhat flat before, thick, slightly bilobed; whitish, mottled with gray-luteous, white on face, black bordered, dotted, the black edge depressed to apex of clypeus, covering the apices of the paraclypeal pieces; epistoma greenish; width 2.7 mm. Body normal, thick, equal and cylindrical, a cylindrical papilla bearing tubercle ii on joint 12 about twice as long as thick; tubercle iv of joint 12 elevated and white. Anal plate large, rounded triangular; anal foot plates elongate triangular. Thoracic feet moderate, pale. Subventral fold waved, distinct. Ocherous wood brown, the dorsum checkered in large segmentary diamonds, edged by lateral waved black mottlings that reach the subdorsal region intersegmentally and depressed to tubercle iii segmentarily, nearly absent on joints 10 to 13. Thorax darker brown, obscurely. Two rounded, obliquely placed, small white spots on joint 6 and white dots behind tubercle ii throughout; white dots behind tubercle iv and, on joint 6, several dots before the spiracle. A slight transverse ridge on joint 12 bearing the papillae (ii), black before, white behind. Subventral ridge slightly pale. Venter marked like dorsum with a black mottled lattice on a brownish ground, but less distinctly. Tubercle i black marked, distinct in the pale brown areas.

Food plant. The larvae ate wild cherry.

Eggs from a ♀ taken at the mouth of the Platte Canyon, twenty miles from Denver, Colorado; eggs June 8th, mature larva July 8th.

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A PROBABLE NEW TYPE OF HYPERMETAMORPHOSIS.

BY JAMES G. NEEDHAM, LAKE FOREST, ILL.

While collecting stone-flies in Fall Creek at Ithaca, N. Y., in July, 1901, I found attached to some of the smaller stones in the edges of the current numerous larval and pupal cases of micro-caddis-flies. I was not at first entirely certain that they were caddis-fly cases: but I took a few of them into the laboratory and examined their contents. One contained a larva of the form shown in fig. 1, easily referable to the family Hydroptilidae of Trichoptera; one contained a transforming larva (*prepupa: subnympha*) of the form shown in fig. 2 — a form so unusual in this family as to awaken immediate interest; and the remainder contained pupae. The cases were 3 mm. long, of the form shown in fig. 5, elongate oval, with a process at each end for attachment to the stone, thin, flat, of a yellowish brown color, and so translucent that the stage of development of the contained animal could be easily recognized under the microscope before opening them. Such cases have not hitherto been known for caddis-fly larvae: they probably represent a genus of Hydroptilidae for which the immature stages have not been described — perhaps Phryxicoma, to which genus the two lone American specimens of which our literature treats, have been referred.

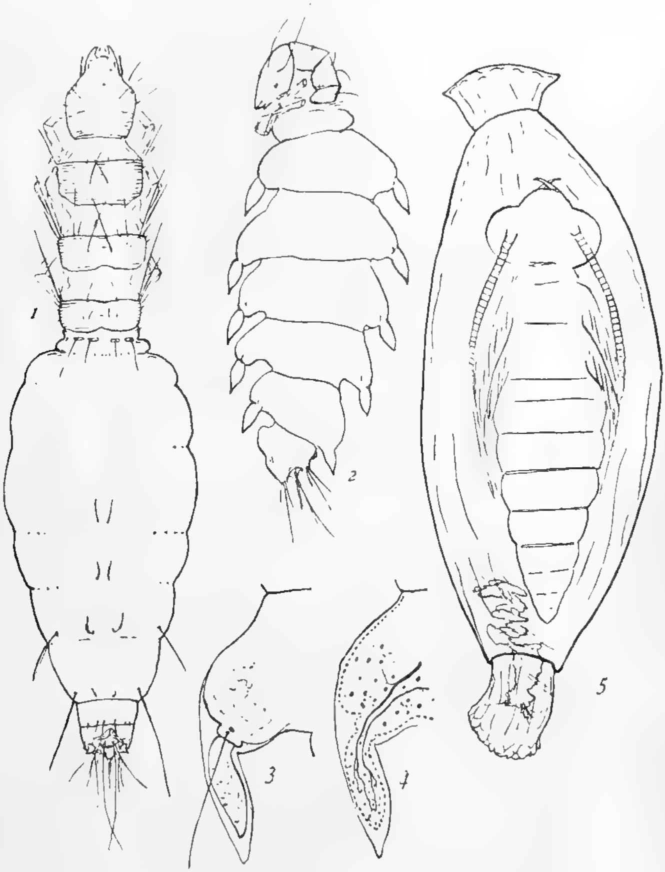
I was then so fully occupied with the study of other aquatic insects that I could give but little time or attention to these: but I wished to see more of that singular prepupa, and I managed to spend an hour on the 11th of July collecting especially for it. I found the cases everywhere on the vertical surfaces of stones washed by a swift current, and had no difficulty in gathering for preservation several dozen of them. Recently I have studied this material. It contained three larvae of the sort shown in fig. 1, three prepupae of the form shown in fig. 2 and a very large number of pupae with the general appearance sketchily shown in fig. 5. The small number found in the earlier stages, and the considerable number of empty cases found, showed the season of transformation was well advanced. Two of the larvae were still active when collected: I saw them moving freely within their cases, though the apertures at the ends seemed to be already closed. Most Hydroptilid larvae carry their cases with the thin edge upward, and in transformation, when the case is attached flatwise, lie on their side; but these larvae lay on thê venter, and the depressed abdomen with its short recurved hairs seemed to indicate that as the normal position. Prepupa and pupa lie likewise with the ventral surface to the stone, the former with the head and thorax and terminal abdominal segments twisted to the left side. At this stage the most remarkable feature of the animal is the presence of five pairs of appendages jointed upon the sides of abdominal segments 3–7. Such appendages are wholly unknown in this order (although quite characteristic of several aquatic genera of the Neuroptera); and if, as I suppose, these larvae, prepupae, and pupae form a single series representing one species, their transitory appearance at the end of larval life is a deviation from the normal course of metamorphosis wholly without a parallel.

The nature of these appendages is shown in detail in figures 4 and 5. Figure 4 is an external view and shows how completely the appendage is articulated to the side of the abdominal segment. Figure 5 is a frontal section of the same and shows its internal structure. There is, as everywhere, an outer layer of hypodermis (shown as a line of dots) to which the old and loosened cuticle, which has not participated in the articulation, does not conform; there are two tracheae passing out from the body cavity into the appendage and repeatedly branching there, and penetrating the mass of fat tissue which fills the entire cavity, and which is entirely similar to the fat filling the lateral extension of the abdominal segment which supports the appendage: there are no other tissues entering into its composition.

Two fairly distinct types of hypermetamorphosis have been distinguished hitherto: one of these occurs among the Hymenoptera and is apparently restricted to egg parasites (*Platygaster*, *Polynema*, *Teleas*, *etc.*): among these the hatching of the egg occurs apparently very early, and the earliest free stages are regarded as embryonic rather than larval; obviously, our caddis-fly has nothing to do with this type.

The other type occurs among the Neuroptera (*Mantispa*) and Coleoptera (*Epicauta*, *Meloe*, *Sitaris*, *etc.*). Among these the larva hatches six-legged and active (Campodeiform) and during its larval life becomes footless, sluggish and distended with accumulated fat (Eruciform). These forms are held to furnish the best of ontogenetic evidence as to the course of development of complete metamorphosis among insects. The striking change of form, which here constitutes hypermetamorphosis, occurs during the period of larval growth, and is therefore unlike that which we are describing.

There is also in those insects whose transformation is most complete and rapid, after the cessation of feeding on the part of the larva, a period of making over into the pupal form: this prepupal stage is due to the swelling and shortening of the larva under its loosened cuticle. While the most striking forms of prepupae hitherto described (*Agrioytpus*, *etc.*) have been pointed out as cases of hypermetamorphosis, it is to be noted that they are all forms strictly intermediate between the larva and the pupa, and all exceedingly transitory, gradually but quickly assumed and quickly lost again; and not truly hypermetamorphic, in the same sense as are the two types mentioned above.



Our caddis-fly, however, is apparently worthy to be ranked as an illustration of a third type. Besides the three normal developmental stages, it takes on in the prepupal period characters which do not belong to either larva or pupa, and are not intermediate between these stages.

The possibility that my specimens did not all belong to the same species, and that these peculiar appendages of the prepupa may have belonged to the larva of the same species, is not to be entirely overlooked, even though it be highly improbable. The discovery of such appendages on a Trichopterous larva would, indeed, be sufficiently surprising. The gills of Trichopterous larvae are simple or tufted filaments; and the larvae of the Hydroptilidae, so far as known, do not possess even these. Stout processes, articulated at the sides of the abdomen and arranged segmentally are entirely unknown in this order, but occur in certain Coleopterous and Neuropterous larvae. Most like the appendages of our prepupa are the lateral filaments of the larvae of Sialidae, especially, of *Sialis*: here the several jointed lateral processes are articulated to the sides of the abdomen. In *Sisyra* and *Climacia* (family Hemerobiidae of Neuroptera) are similar, jointed filaments directed toward the midventral line beneath the abdomen.

I am inclined to believe that these appendages are inherited from some remote, primitive Neuropterous type. I regard them as belonging in the same category as the large, transitory mandibles of the pupa.

RECORDS OF THE HABITS OF NEW MEXICAN COLEOPTERA.

BY T. D. A. COCKERELL, EAST LAS VEGAS, N. MEX.

Unless the contrary is specified, the authority for the identification is in every case Mr. H. C. Fall, to whom I am under the greatest obligations. When the collector's name is not given, the material was collected by the present writer. Townsend = C. H. T. Townsend. Wooton = E. O. Wooton.

Cicindela sperata Lec. Rincon, July 5; numerous in the bed of the Rio Grande, copulating.

Hippodamia sinuata Muls. Mescalero, on *Chrysothamnus graveolens glabratus*, Oct. 1.

Coccinella oculata Fab. Mescalero, on *Chrysothamnus graveolens glabratus*, Oct. 2.

Psyllobora 20-maculata Say. Rio Ruidoso, about 6500 ft., on *Rhus glabra*, July 24. (Townsend).

Chrysobothris carinipennis Lec. Rio Ruidoso, about 6500 ft., on cut pine branches, Aug. 4. (Townsend).

Chrysobothris debilis Lec. (det. Wickham). In coitu on *Prosopis glandulosa*, May 13, 1892. (Townsend).

Acmæodera sparsa Horn. Organ Mts., back of S. Augustine, on *Chrysopsis villosa*. Sept. 1. (Wooton); Rio Ruidoso, about 6500 ft., on flowers of *Achillea millefolium*, July 30. (Townsend).

A. disjuncta Fall. La Cueva, Organ Mts. (Townsend). I collected one at

Juarez, State of Chihuahua, Mexico, Oct. 6, on *Helianthus annuus.*

A. scalaris Mann. Sand hills near Mesilla Park on flowers of *Polypteris hookeriana*, Sept. 15 (Townsend).

Lygistopterus rubripennis Lec. Rio Ruidoso, about 6900 ft., on flowers of *Verbascum thapsus*, July 20. (Townsend).

Chauliognathus limbicollis Lec. Above Mescalero, on *Sphæralcea fendleri*, Aug. 21. (Wooton).

Macrodactylus uniformis Horn. Rio Ruidoso, about 6500 ft. on flowers of *Monarda stricta*, July 18. (Townsend); Lone Mtn., July 6, on Concord grape vine.

Rhopalophora laevicollis Lec. Rio Ruidoso, about 6600 ft., on flowers of *Solidago trinervata*, July 20. (Townsend).

Tragidion fulvipenne Say. Dripping Spring, Organ Mts., several on a *Kermes*-infested oak branch.

Tylosis maculata Lec. La Cueva, Organ Mts., about 5300 ft., on leaves of *Sphaeralcea*, Aug. 31. (Townsend). This and the next both have the colors of the flowers of the plants on which they occur.

Crossidius pulchellus Lec. Mescalero, Oct. 2, on *Chrysothamnus graveolens glabratus*; also from Mesilla Park (det. Wickham), on *Gutierrezia glomerella*, Sept. 23.

Strangalia sexnotata Hald. Rio Ruidoso, about 6600 ft., on flowers of *Solidago trinervata*, July 20. (Townsend).

Leptura canadensis cribripennis Lec. Rio Ruidoso, on flowers of *Rhus glabra*, July 21 (Townsend).

Lema concolor Lec. S. Fork Eagle Creek, about 8000 ft., on brake fern, Aug. 13. (Townsend).

L. trilineata Oliv. Mesilla Park, on cultivated *Datura*, Aug. 5.

Coscinoptera axillaris Lec. La Cueva, Organ Mts., on flowers of *Fallugia*, Sept. 3. (Townsend).

Chlamys plicata Fabr. (det. Horn). Mesilla Park, on *Larrea.*

Cryptocephalus spurcus Lec. Mesilla Park, on *Pluchea borealis*, May 14. Also occurs on *Larrea.*

C. quadrimaculatus Say. Rio Ruidoso, about 7000 ft., on brake fern, Aug. 6. (Townsend).

Calligrapha serpentina Rog. San Augustine Ranch, on *Sphaeralcea munroana*, Sept. 1. (Wooton).

Microrhopala vittata Fab. Rio Ruidoso, about 7000 ft., on brake fern, Aug. 6. (Townsend).

Coptocycla clavata Fab. Mesilla, Aug. 18, on *Physalis.*

C. aurichalcea Fab. Rio Ruidoso, about 6500 ft., on *Rhus glabra*, July 24. (Townsend).

Bruchus amicus Horn. La Cueva, Organ Mts., about 5300 ft., on flowers of *Lippia wrightii*, Sept. 5. (Townsend).

B. seminulum Horn. Las Vegas, on flowers of *Petalostemon oligophyllus*, July, 21.

Epitragus canaliculatus Say. Santa Fé, "eating blackberries," August. (Myrtle Boyle).

Statira pluripunctata, Horn. San

Augustine Ranch, in flowers of *Datura meteloides.*

Mordella marginata Mels. Rio Ruidoso, on flowers of *Rhus glabra*, July 19, about 6500 ft. (Townsend).

Zonitis flavida Lec. Las Vegas, at flowers of *Cleome serrulata*, June 29.

Epicauta pennsylvanica DeGeer. Above Mescalero, on *Sphaeralcea fendleri*, Aug. 21. (Wooton)*.

Eupompha fissiceps Lec. (det. Schwarz). Plains east of San Andreas Mts., on *Lycium berlandieri*, July 15. (Wooton); Mesilla Park, July 17, one on *Larrea*.

Rhipiphorus cruentus Germ. Fillmore Cañon, Organ Mts., on flowers of *Solidago canadensis arizonica*, Sept. 1, about 5700 ft. (Townsend).

Attelabus bipustulatus Fab. Rio Ruidoso, about 6500 ft., on *Rhus glabra*, July 24. (Townsend).

Peritaxia hispida, Horn. La Cueva, Organ Mts., under prostrate sotol, Sept. 4. (Townsend). The sotol is *Dasylirion wheeleri.*

Pandeletejus cinereus Horn. Las Cruces, on *Prosopis glandulosa*, May 6, (Townsend).

Apion tenuirostrum Sm. and *A. varicorne* Sm., together on flowers of *Petalostemon oligophyllus*, Las Vegas, July 21.

Smicronyx imbricatus Csy. Las Vegas, on flowers of *Convolvulus arvensis*, June, 17.

Otidocephalus vittatus Horn. Embudo, on *Chrysothamnus*, Sept. 26.

Anthonomus albopilosus Dietz. Embudo, on *Croton*, Sept. 25.

Desmoglyptus crenatus Lec. Lone Mtn., on Concord grape vine, June 6.

Trichobaris compacta Csy. La Cueva, Organ Mts., on leaves of *Datura meteloides*, Aug. 30. (Townsend).

Centrinus acuminatus Csy. Las Cruces, on flowers of *Sphaeralcea* Sept. 9. (Townsend).

Scyphophorus acupunctatus Gyll. La Cueva, Organ Mts., under prostrate sotol, Sept. 3. (Townsend).

Pityophagus verticalis Horn. Eagle Creek, about 7000 ft., Aug. 11, in hole in live pine at Gilmore's Ranch. (Townsend.)

Dendroctonus terebrans Oliv. Eagle Creek, about 7000 ft., Aug. 11. Townsend has written the following note: "Gilmore's Ranch; boring in live pine tree roots between bark and sapwood and making hole through resin both hard and soft; keeping hole open to outside; resin is running continually. When resin gets hard beetle bores out, leaving pile of chips of resin marking hole. (Alfred Holt)."

*I may as well record here the occurrence of *Epicauta caviceps* Horn, and *E. wheeleri* Ulke, (both det. Wickham) on *Isocoma hartwegi* at Tuscon, Arizona, the specimens received from Prof. Toumey.

Dichopetala brevicauda — A Correction.

Under this name Scudder described (Can. ent., xxxii, 331–332, 1900) a locustid from California and more recently through inadvertence proposed the same name for a species from New Mexico (First list orth. New Mex., p.

51 — Proc. Davenport acad. sci., IX, 1902). At Mr. Scudder's request I have just examined the species concerned and find that the first described is a short-winged Arethaea closely allied to *A. carita* Scudd., (First list orth. New Mex., p. 52) and consequently becomes *A. brevicauda*. The New Mexican species is a true Dichopetala but a change in the specific appellation is necessary and *brevihastata* (a name suggested by and to be credited to Mr. Scudder) may take its place.

A. P. Morse.

GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — II.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Subfamily EUPLOEINAE.

Mature caterpillar: Head smooth, uncrowned. Body cylindrical, tapering anteriorly, naked, but provided with a greater or less number of lateral ranged fleshy protuberances or filaments, never with spines, and gaily and brightly colored, generally with transverse stripes. Feeds almost exclusively on Asclepiadaceae and Solenaceae. *Chrysalis*: With no conspicuous prominences, all the part rounded, the thorax and abdomen generally not deeply separated, the appendages not raised above the general curve of the body, the abdomen plump, or with some portion of the body specially plump.

Tribe Limnaini.

Butterfly: Males provided on hind wings with one or more spot-like pockets concealing androconia, or a surface patch or patches of androconia (wanting in some paleogean genera), but no rows of erect hairs. Females with short and club shaped fore tarsi. *Egg:* (Distinction from Ithomyini not known) *Caterpillar at birth:* Some of the body segments provided, besides the ranged bristles, with low roughened tubercles. *Mature caterpillar:* Body furnished with slender and filamentous appendages; otherwise naked; markings mostly transverse. Feeds on Asclepiadaceae. *Chrysalis:* Dorsally very tumid at about the third abdominal segment, often transversely ridged in this part; markings not unusually prominent.

Synopsis of the genera.

1. Anosia. *Butterfly:* Cell of fore wing nearly three fifths, of the hind wing about two thirds, as long as the wing. No spots in the middle of median interspaces of fore wings. *Egg:* Half or less than half as high as broad, with more

than twenty vertical ribs nearly all reaching the summit. *Caterpillar at birth:* Ranged appendages simple tapering hairs not half so long as segments; a pair of papilliform naked tubercles on second thoracic and eighth abdominal segments. *Mature caterpillar*: With a pair of long fleshy filaments on the same segments but not on second abdominal segment. *Chrysalis:* Ocellar tubercles slight and but little prominent; semicircle of mammilate points on third abdominal segment in a horizontal series when pendant.

2. TASITIA. *Butterfly*: Cell of fore wings hardly more than one half, of the hind wings less than three fifths, as long as the wings. A series of white spots in the middle of median interspaces of fore wings. *Egg*: Unknown. *Caterpillar at birth*: Unknown. *Mature caterpillar*: With a pair of long fleshy filaments on the second thoracic and second and eighth abdominal segments, *Chrysalis*: Ocellar tubercles rather prominent; semicircle of mammilate points on third abdominal segment in an oblique series when pendant.

Anosia Hübner.

Butterfly: Palpi moderately stout, densely clothed with long hairs to the tip; club of antennae twice as stout as stem. Discoidal cell relatively long, in the fore wings nearly three fifths, in the hind wings about two thirds as long as the wing; fore wings with produced apex so that the wing is twice as long as broad, the cell much longer above than below. *Egg*: Half as high again as broad, or slightly less, rapidly tapering to a rounded summit, with over twenty not very prominent vertical ribs most of which reach the summit, and numerous straight and delicate transversals forming quadrangular cells. Laid singly. *Caterpillar at birth*: Subdorsal and supralateral appendages anterior, lateral and infrastigmatal posterior, and laterostigmatal median, none half as long as segments; on second thoracic and eighth abdominal segments a pair of lateral naked tubercles. *Mature caterpillar*: A pair of long fleshy filaments on the second thoracic and eighth abdominal segments (but none on second abdominal), the hindmost but little longer than the segment. *Chrysalis*: Stout and rounded, the ocellar tubercles slight and not very prominent, the semicircle of raised points on third abdominal segment horizontal when pendant. (ἀνόσιος, unholy, in reference to its color?)

A. plexippus Linn. (*Danais archippus* Auct., *Pap. erippus* Cram.). *Butterfly*: Wings bright tawny brown, paler on the under surface of the hind wings, the veins all marked with black and both costal and outer margins broadly bordered with black, sprinkled with white dots; besides the whole apex of the fore wings is more or less deeply black but enlivened by two or three dull tawny interspaceal subapical spots and by a couple of parallel series of large white or buff spots crossing the apex beyond the cell, the outer only crossing the wing. Expanse 100 mm. *Egg*: Pale amber green; vertical ribs twenty-two in number, intervals smooth and glistening. Height 1.2 mm. *Caterpillar at birth*: Head piceous. Body pale green, slightly infuscated on anterior border of the segments; ranged appendages black; tubercles of second thoracic and eighth abdominal segments fuscous; a piceous laterodorsal blister on first thoracic segment. Length 3 mm. *Mature caterpillar*: Head yellow with piceous arched bands. Body transversely banded with more or less interlocking bands of white, black, and lemon yellow; spiracles piceous; filaments black. Length 45 mm. Feeds on various species of Asclepias but especially *A. cornuti* and has been found also on Acerates and even on Apocynum. *Chrysalis*: Delicate pea green, tubercles gilt, but those of third abdominal segment set in a tricolored band, shining piceous in front, gilt behind and nacreous between, the last two dividing the tubercles. Length 27 mm.— The entire United States and southern Canada from Atlantic to Pacific, but believed to winter in the more southern portions and annually to migrate north, breeding beyond as well as within its natural region, returning south in the autumn in swarms. At least double brooded in the south. Wintering as a butterfly, on the wing all summer.

Tasitia Moore.

Butterfly: Palpi moderately slender, thinly clothed with hairs and scales; club of antennae less than twice as stout as stem. Discoidal cell relatively short, in the fore wings hardly more than one half, in the hind wings less than three fifths the length of the wing; fore wings less produced, being less than twice as long as broad, the cell no longer above than below; androconial pouch of hind wings larger than in Anosia. *Egg*: Unknown. *Caterpillar at birth*: Unknown. *Mature caterpillar*: With a pair of long fleshy filaments on the second thoracic, second and eighth abdominal segments, in all cases much longer than the segments.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXIV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Deilinia quadraria Grote.

Egg. Elliptical, the large end strongly, a little obliquely truncate, the other flattened depressed; truncate end convex in the center. Reticulations linear, narrow, slightly raised, arranged in straight rows the length of the egg or very slightly spiralled, alternated, so that the parallel lines are waved; just at the edge of the truncation the reticulations become small, sharp ridges. Truncate end smooth, obscurely reticulate. Light blue-green; size .9 x .55 x .4 mm.

Stage I. Head rounded, reddish luteous, the pointed mouth brown; slightly bilobed, free, nearly erect. Body moderate, normal, uniform, smooth, whitish; a rather broad purple brown dorsal stripe, roundedly diffuse at the ends and a similar subventral one on joints 2 to 13, narrowly diffuse at the ends, segmentarily submaculate in darker. Feet whitish, normal; tubercles and setae obsolete.

Stage II. Head rounded, bilobed, with small shield-shaped clypeus, free, erect; whitish, dotted mottled in purple gray, but leaving a pale, erect streak on each lobe. Body slender, rapidly vibrant before looping; whitish, opaque; dorsal stripe broad, purple brown, rounded at the ends; subventral segmentary spots connected by a subobsolete line. Later the dorsal stripe is grayish shaded, obsoletely resolved into several lines, segmentarily maculate. Sides pale gray, very obsoletely lined, finely, like the dorsum. Still later the dorsal stripe fades to obsolescence, leaving a slight shade and a few dots. The subventral spots remain separate.

Stage III. Head rounded, bilobed, thick, flattish before; gray white, flecked with black, heavily so outwardly and each side of the median suture in the vertical notch; width, .8 mm. Dorsum to the tubercles dark gray with a darker, geminate dorsal and single subdorsal line (i and ii); sides whitish with three fine dark lines, the lower one on tubercle iii; a broader, but narrow, whitish stigmatal space. Subventer and venter like the sides with a number of fine, dark, rather irregular lines and a row of rounded, nearly black subventral segmentary patches. Feet pale, dark dotted, stained at base by the dark subventral patches. Tubercles in distinct black spots. Later more uniformly hoary gray with subdorsal and stigmatal pale lines and discreet subventral black spots.

Stage IV. Head 1.5 mm. wide, whitish with large mottlings in dots of black, thickly in the clypeus, those on the lobes somewhat parallel to the clypeus, the dots subconfluent in lines. Body smooth, uniform, moderate. Dorsum dark gray, with about six crinkled dotted pale lines on each side, of which the subdorsal is straight and more distinct than the others with the dark tubercles i and ii above it. Stigmatal line white, yellow blotched behind the spiracles, diffuse below, narrow, cut by the black tubercle iv. Venter lighter gray, finely lined in dark gray and cinereous, the black subventral segmentary patches rounded and distinct. Tubercles in black spots. Feet dull reddish, black spotted, the abdominal ones dark; no shields.

Stage V. (Brown form). Head rounded, shallow bilobed, erect, free; clypeus broadly triangular, the paraclypeal pieces narrow, parallel; lilaceous white, thickly, uniformly covered with black dots, the pale spaces between somewhat serpentine; width 2 mm. Body normal, moderate, cylindrical, equal; dorsum blackish gray, mottled dotted in longitudinal lines, leaving obscurely a paler dorsal and subdorsal line, dark shaded before the black tubercles. Stigmatal line narrow, distinct, pale yellow, dark yellow blotched at the black rimmed spiracles. Venter lighter, mottled dotted in black on a wood-brown gray ground, the tubercles black. Feet lilaceous, dark mottled. Setae short, dark. (Green form). Head green, faintly brown mottled. Body green, dorsum faintly lined in white, finely dotted, the subdorsal line the most distinct. Stigmatal line white, narrow, yellow blotched at the spiracles. Venter more faintly white mottled lined.

Food plant. A low, thorny shrub growing on the foot hills, 500 feet or more above the plains (*Ceanothus fendleri*).

Eggs from ♀♀ taken near the summit of the foot hills back of Golden, Colorado. Eggs May 30th to June 27th from different females; mature larvae by July 10th. Pupation in the ground.

④ PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of ech month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

PSYCHE.

NEW AGRICULTURAL ANTS FROM TEXAS.*

WILLIAM MORTON WHEELER, AUSTIN, TEX.

√

Pogonomyrmex desertorum, sp. nov.

Worker. Length 5.5-6.5 mm.

Head rectangular, exclusive of the 7-toothed mandibles slightly broader than long; posterior margin slightly concave. Anterior border of clypeus broadly but faintly excised. Frontal area triangular, as broad as long, with a distant median carinula. Eyes in the middle of the lateral surfaces of the head. Antennal scape reaching to midway between the eye and the posterior corner of the head. Thorax of the usual shape, with two rather slender epinotal spines about as long as their distance apart at the base, directed obliquely upward, backwards and outwards. Petiole compressed at the base, its peduncle shorter than its node, which is pointed in front so that the ascending dorsal surface forms an obtuse angle in profile; posterior descending dorsal surface gently convex; lower surface of petiole with a very distinct downwardly directed tooth. Postpetiole campanulate, slightly broader than long, its ventral protruberance very small but distinct. Gaster and legs of the usual configuration.

Mandibles with coarse, parallel striae. Frontal area smooth and shining. Clypeus, sides and upper surface of head traversed by very delicate parallel rugae, which are very close together and scarcely divergent posteriorly. Interrugal punctures indistinct and in a single row between each pair of rugae. Posterior angles of head smooth and shining. Thoracic and coxal rugae mostly transverse, even on the meso- and metapleurae. Infraspinal facet of epinotum smooth and shining. Petiole, postpetiole and legs covered only with delicate microscopic reticulation.

Trunk and legs beset with bristly pale yellow hairs which are erect on the dorsal surface of the head and thorax and suberect on other portions of the body and appendages; the erect hairs on the head are only about half as long as those on the thorax. Lower surface of head and mandibles with the usual beard of long recurved hairs. Pubescence none.

Whole ant yellowish red with the exception of the eyes and dentate mandibular edges, which are black.

This species was taken (Dec. 19, 1901) in several localities in Presidio County, Trans-Pecos Texas, from the southern end of Fresno Cañon northward through Alamito to San Esteban, which is located a few miles south of Marfa. These localities have an elevation of 4000–5000 ft. The species occurs also in New Mexico, whence I have received a worker taken by Prof. T. D. A. Cockerell at Mesilla Park ("in the *Pluchea* zone.")

At first sight *P. desertorum* resembles *P. californicus* Buckley on account of its yellowish red color. It differs, how-

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*Contributions from the Zoological Laboratory of the University of Texas, No. 34.

ever, from this species in possessing epinotal spines and smooth posterior corners to the head and from this and all other described North American species in the very dense and delicate cephalic rugae.

P. desertorum inhabits the dry stony soil above the flood marks of the streams on the cañon sides where there are only a few xerophytic shrubs like *Fouquiera splendens*, *Jatropha spathulata*, *Condalia mexicana*, *Larrea mexicana*, and *Flourensia cernua*. In the open sun-lit spaces among these shrubs the ants make solitary mounds 4–6 inches across and perforated in the centre with an entrance about ¼ inch in diameter. They feed on the seeds of a coarse, tufted grass (*Munroa* sp.) which is found growing sparsely near the nests. After the diminutive seeds are removed from the relatively voluminous chaff, the latter is deposited by the ants on the mound immediately around the entrance of the nest. Occasionally the new species builds its nests under single or clustered stones like *P. imberbiculus* Wheeler.* None of the nests contained more than a dozen workers, but the weather was very cold and dry and the bulk of the colony may have been hibernating at some inaccessible depth in the stony soil. There can be no doubt, however, that the colonies of this species are very much smaller than those of *P. barbatus* and *P. occidentalis*.

*This habit is perhaps only exceptional with *imberbiculus*, for I have recently seen these ants building neat little mound nests 3–4 inches in diameter in the dry stony bluffs along the Concho River at San Angelo, Texas.

POGONOMYRMEX SANCTI-HYACINTHI, sp. nov.

Worker. Length 7.5–9. mm.

Head rectangular, exclusive of the 7-toothed mandibles as broad as long; posterior margin straight. Anterior border of clypeus with a deep, broad, almost semicircular excision. Frontal area triangular, distinctly longer than broad, convex but scarcely carinulate in the middle. Eye in the middle of the lateral surface of the head. Tip of antennal scape reaching to midway between the eye and the posterior angle of the head. Thorax shaped like that of *P. barbatus* but without epinotal spines, their position being indicated in some specimens by a pair of rather short indistinct ridges or projections. Petiole short, the node longer than the peduncle and much lower and blunter than in *barbatus*, the anterior ascending and posterior descending dorsal surfaces of about equal length, the former slightly concave in profile but not distinctly angular as in *barbatus*, the latter depressed in front and slightly concave behind. Tooth on the ventral surface of petiole obsolescent. Postpetiole campanulate, slightly longer than broad, evenly convex above, its ventral protuberance very slightly developed as compared with *barbatus*. Gaster and legs of the usual appearance.

Mandibles shining, coarsely and deeply striated. Frontal area opaque. Front and sides of head covered with numerous, parallel, clean-cut rugae and with small piligerous punctures. The rugae are somewhat finer than those of *barbatus* and scarcely diverging except on the extreme posterior portion of the head. Interrugal sculpture indistinct, consisting of very shallow, confluent foveolae. On the posterior angles the rugae are replaced by a delicate reticulation and this disappears to leave the corners of the head smooth and shining. Thoracic sculpture like that of the typical *barbatus* but somewhat finer, the prevailing directions of the rugae being transverse on the pro- and epinotum and longitudinal on the mesonotum and meso- and metapleurae. Petiole, postpetiole and gaster shining, covered with delicate, even, microscopic reticulation. Upper surface of petiolar node with a few faint longitudinal rugae. Coxae faintly rugose and, like the remainder of the legs, covered with delicate microscopic reticulation.

Body and appendages beset with bristly, pale yellow hairs, very long and projecting forward on the clypeus, shorter and erect on the upper surface of the head and thorax, suberect on the remainder of the body. Beard of long, recurved hairs on the lower surface of the head and mandibles well developed. Pubescence none.

Whole ant deep ferruginous red, excepting the following portions which are black: dentate edges of mandibles, anterior border of clypeus, eyes, ventral edges of the pleurae and sutures between the petiole and postpetiole and between the latter and the gaster.

Described from numerous specimens collected in the open spaces among the dry chapparal and mesquite thickets near San Pedro Springs, San Antonio, Texas, on the anniversary of the battle of San Jacinto (April 21, 1902).

P. sancti-hyacinthi superficially resembles *P. barbatus* var. *molefaciens* Buckley but besides its somewhat smaller size the new species may be very readily distinguished by its very deeply excised clypeus, the straight occipital border, the smooth and shining posterior angles of the head,* the absence of the epinotal spines, the smooth petiole and postpetiole, the much more depressed and rounded petiolar node and obsolescent ventral tooth, and the conspicuously smaller ventral protuberance of the postpetiole. It differs from *P. californicus* in its larger size, deeper coloring, the extent of the clypeal excision, smooth posterior angles of the head and blunter petiolar node.

Although it is very easy at first sight to confound *P. sancti-hyacinthi* with *P. molefaciens*, which occurs in the same locality, this is not the case with the nests of the two species. Instead of huge gravel cones or extensive discs, the former species builds only small, flat, dirt-cones, sometimes in close clusters of two, three or four, and each measuring not more than 4--8 inches across, with a central perforation about ¼ inch in diameter. The periphery of each mound is often covered with a thick layer of chaff and other vegetable débris which has been cast away by the ants and may become the abode of colonies of termites. The nests are much less populous than those of *P. molefaciens*.

Pogonomyrmex barbatus F. Smith var. nigrescens, var. nov.

The worker of this striking variety differs from the typical *barbatus* of Mexico in its smaller size and the deep reddish black coloration, not only of the head and thorax as in the Mexican form, but also of the antennal scape, petiole, postpetiole, gaster and femora. The tip of the gaster is very nearly as dark as the base. Mandibles, funiculus, tibiae, tarsi and peduncle of petiole deep ferruginous red. Sculpture like that of the

*The last character is sometimes, though rarely, found in *barbatus*.

typical *barbatus*, the rugae being often very coarse and irregular on the pronotum. Coarse hair covering the body grayish white; beard rather scanty and almost absent in several of the specimens.

Described from 14 workers kindly given me by Mr. A. M. Ferguson. They were collected at Eagle Pass, Tex. by a lady who found them carrying away the buds of the singular gnetaceous *Ephedra antisyphilitica*. Two other specimens which evidently represent a transition to *P. barbatus* var. *marfensis* Wheeler were collected at Mesa Negra, San Ildefonso, New Mexico by Mr. E. L. Hewitt and Miss Ruth Reynolds. In these specimens the petiole and postpetiole are red, the former being distinctly grooved longitudinally. The beard is well developed. √

The addition of the preceding variety and two species to our fauna leads me to revise my recently published table of the North American *Pogonomyrmex*.* A third species, *P. schmitti* from Hayti has also been recently described by Forel.† As this West Indian species, the Texan *imberbiculus* Wheeler and the Brazilian *nägelii* Forel form a compact group of forms more closely related to one another (in size, sculpture, absence of beard, etc.) than to any other species of the genus, they may be included in a distinct subgenus for which I would propose the name *Ephebomyrmex*.

* Am. Natur. Vol XXXVI No. 422, 1902, pp. 97–99.

† Ann. Soc. Entomol. Belg. Tome XLV, 1901, pp. 339–340.

Pogonomyrmex sensu lato would then comprise the species of the genus proper, the subgenus *Janetia* Forel (with the single species *J. mayri* Forel from Colombia) and the subgenus here proposed. The workers of the nine known North American species of *Pogonomyrmex* may be distributed as follows:

*Small species, less than 5 mm. long; under surface of head without a beard of long recurved hairs; epinotum with four spines; head, thorax and petiole reticulate-rugose. (*Ephebomyrmex*, subgen. nov.)

1. Color red — *imberbiculus* Wheeler.
2. Color black — *schmitti* Forel.

*Large species, more than 5 mm. long; under surface of head with beard of long recurved hairs; epinotum unarmed or with only two spines; head and thorax finely rugose, the rugae parallel and not distinctly reticulate. (*Pogonomyrmex* s. str.)

† Epinotum with a pair of spines.

§ Posterior angles of head smooth and shining. Sculpture of head and thorax very fine. *desertorum*, sp. nov.

§§ Posterior angles of head not smooth and shining. Sculpture coarser.

A. Head evenly and finely rugose, rugae but little divergent posteriorly, without distinct interrugal sculpture. *barbatus* Smith.

1. Head, thorax and legs black; petiole, postpetiole and gaster red. *barbatus* Sm (*typical*).

2. Cephalic rugae finer and denser, body ferruginous throughout.

var. *molefaciens* Buckley.

3. Head and thorax brownish red, gaster in part or entirely brown, rugosity as in No. 2 or somewhat coarser.

var. *fuscatus* Emery.

4. Rugosity a little coarser than in No. 1; head, thorax and legs black, petiole and postpetiole brown, abdomen red, node of petiole longitudinally rugose.

var. *marfensis* Wheeler.

5. Color reddish black, peduncle of petiole, tibiae, tarsi and funiculus red; sculpture as in no. 1.; beard scanty.

var. *nigrescens*, var. nov.

6. Head and thorax much more coarsely rugose than in Nos. 1–4. Rugae irregular in direction on the pro- and mesonotum, transverse elsewhere on the thorax. Petiole rather coarsely and irregularly rugose; its peduncle shorter than in No. 1; postpetiole rugose-punctate.

subsp. *rugosus* Emery.

B. Head less densely rugose; the rugae distinctly divergent posteriorly; interrugal spaces densely and distinctly foveolate-punctate.

a. Ventral surface of petiole without a distinct tooth; infraspinal facet of epinotum rugose, scarcely shining.

occidentalis Cresson.

1. Head opaque, interrugal punctures very distinct.

occidentalis Cr. (typical).

2. Head more shining, interrugal punctures less pronounced; petiole less opaque than in No. 1.

var. *subnitidus* Emery.

b. Petiole with a distinct tooth below; infraspinal facet of epinotum shining, without rugae. *subdentatus* Mayr.

† † Epinotum without spines.

§ Posterior angles of head smooth and shining; clypeus deeply excised. *sancti-hyacinthi*, sp. nov.

§ § Posterior angles of head not smooth and shining; clypeus not deeply excised.

a. Interrugal spaces of head indistinctly and confluently punctate; workers monomorphic. *californicus* Buckley.

1. Color yellowish red, peduncle of petiole about the same length as the node; postpetiole as high as long.

californicus Buckley (typical).

2. Darker red: apical third or more of gaster black; petiole and postpetiole often brown, the former slender, its node longer and less erect with rounder or but slightly pointed apex.

var. *estebanius* Pergande.

3. Yellowish red, gaster brown except at the base; peduncle shorter than the very long node, which is pointed above; postpetiole not as high as long. Sculpture fainter than in No. 1, petiole and postpetiole punctate, without rugae.

subsp. *longinodis* Emery.

b. Interrugal spaces of head regularly foveolate-punctate. Color ferruginous red. Workers polymorphic, *i. e.* with size of head greatly varying.

badius Latr.

AUSTIN, TEXAS, May 10, 1902.

POSTSCRIPT.

As the result of recent collecting trips in Central and Trans-Pecos, Texas, I am able to add the following brief notes on some of the species of *Pogonomyrmex* of the above table and on a new species and subspecies which came to light too late to be included.

1. *Pogonomyrmex apache*, sp. nov. This is a fine orange-yellow species, nearly as large as *barbatus*, with smooth posterior angles to the head and without epinotal spines. It is decidedly larger and more robust than *californicus*, which it resembles in sculpturing, and the cone of the petiole is blunter and more depressed. It differs from *sancti-hyacinthi* in coloration and in having a less deeply excised clypeus. Only four isolated nests of *apache* were seen. These were excavated in the dry, stony, adobe soil about Fort Davis in Jeff Davis County. They were in the form of small chaff-strewn mounds, 3–5 inches across, perforated with an entrance about ½ inch in diameter, and containing hardly more than 25–50 workers. Nearly all the workers were busily engaged carrying home grass-seeds. When running they carried the abdomen in a peculiar elevated position.

2. *P. occidentalis* subsp. *comanche*, subsp. nov. This form differs from the typical *occidentalis* and resembles *subnitidus* Emery in the less opaque surface of the head and thorax. It is mainly distinguished, however, by the very short epinotal spines, which are hardly half as long as those of the typical form. It was discovered near Milano, Millan County, in the sandy soil of the open post-oak woods. Here it constructs small mound-nests not more than 4–6 inches across and very unlike the great gravel cones constructed by the typical form in Wyoming and Colorado. There were not more than 50 ants in a nest. At Langtry, in Valverde County, small colonies of the typical *occidentalis* were seen inhabiting similar nests on a sandy spot in the Cañon of the Rio Grande.

3. *P. sancti-hyacinthi.* This species is common at Fort Davis, where it builds small obscure nests among the disintegrating volcanic rocks on the summit of the "Crouching Lion" (altitude about 5400 ft.). While running this species does not carry the abdomen conspicuously erect.

4. *P. desertorum.* Several fine nests

of this species were seen at Langtry, both in the sandy soil of the Rio Grande Cañon and in the stony adobe on the desert hills. These nests were more populous than those observed in Presidio County during the winter of 1901. They sometimes contained upwards of a hundred workers. While running the ants carry the abdomen in a peculiar erect position.

5. *P. californicus.* This species, not before recorded from Texas, is common on the sandy soil of the desert near the cemetery at Marfa, Presidio County. The colonies are smaller than those of *P. desertorum.* It is impossible to find the entrance to the obscure nest, a small hole in the ground, without tracing foraging ants on their return journey. The insects run with conspicuously elevated abdomen. They sting severely.

6. *P. barbatus* var. *nigrescens.* This variety is not uncommon at Del Rio, Langtry, Toronto, near Alpine, and at Fort Davis. It sometimes builds a gravel disc like other varieties of *barbatus*, but at Del Rio and Langtry it was found inhabiting small obscure nests in the stony adobe soil, without making any effort to clear away the vegetation about the entrance. Some of the nests were even excavated about the roots of the small desert acacias, a most unusual habit for *barbatus.* The males and females, which were abundant during early June at Fort Davis, are deep ferruginous red throughout.

7. *P. barbatus* var. *marfensis.* In this form the males and females are colored like the workers, i. e. the head and thorax are black, the gaster bright red. The microërgates of incipient nests have the same coloration as the large workers of old nests. *P. marfensis* is the dominant Pogonomyrmex in Brewster and Presidio Counties at or below an altitude of 5000 ft., where it makes huge gravel discs. So far as my observations extend, the variety *molefaciens* does not occur in these counties. The variety *nigrescens* lives at a higher altitude (above 5000 ft.) except further east (at Del Rio and Langtry) where it shares the lower open country with *molefaciens.*

Rockford, Illinois, July 12th, 1902.

Notes.—Mr. Walter Deane observed a worn specimen of *Basilarchia arthemis* in Cambridge, Mass., July 14.

Cryptorhynchus lapathi Linné is to be recorded from N. H. and Maine; in Maine Mr. J. G. Jack has found it very abundant on willows and poplars at York.

In a Revision of the Cicindelidae of Boreal America (Trans. Amer. ent. soc., 1902, vol. 28, p. 93–186, pl. 1–4) Leng recognizes four genera, Amblychila with three species, Omus ten species and four varieties, Tetracha two species, Dromochorus two species, and Cicindela seventy-three species and fifty-five varieties, a total of ninety species and fifty-nine varieties. Five new species and ten new varieties are described. Plate 1 plots the distribution of the species and varieties of Omus, with the exception of *O. montanus*, in California; plate 2 shows the variation of the labrum, the form of the mandible, the apex of the elytra, and types of elytral maculation, and on plates 3 and 4 the elytral markings of 53 species and 20 varieties of Cicindela are figured.

GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — III.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Tasitia Moore.

Chrysalis: Slenderer in the thoracic region than in Anosia with stouter and more prominent ocellar tubercles, and with the semicircles of raised points on third abdominal segment oblique when pendent.

T. berenice Cram. (*Pap. gilippus* Sm.-Abb.). *Butterfly*: Wings dark reddish chocolate on both surfaces broadly bordered with blackish, the veins darker especially beneath where they are often narrowly edged with white or, above, with steel gray; the black border more or less dotted with white and on the fore wings followed within by a row of white spots, besides which two parallel oblique rows of white spots cross the apical half of the wing, the inner just outside the cell, and similar spots are found in the middle of the median interspaces of the same wings. Expanse of wings 80 mm. *Egg*: Unknown. *Caterpillar at birth*: Unknown. *Mature caterpillar*: Whitish violet with transverse deeper lines, and next the anterior margins of the segments a transverse reddish brown band enclosing a narrow yellow stripe; filaments brown purple. Length 55 mm. Feeds on *Asclepias amplexicaulis*, *A. obtusifolia*, *Gonolobus hirsutus*. *Chrysalis*: Delicate green, the raised points golden, those of the third abdominal segment black on the anterior face set in a blue band. Length 22 mm.— Southernmost United States, as far west as New Mexico and Arizona.

T. strigosa Bates. *Butterfly*: Differs from the preceding, of which it may be only a geographical race, principally in the slightly lighter ground color and the considerably larger size of the round white spots crossing the apical half of the fore wing, not including those upon or next the marginal black band; the black veins of the under side of the hind wings are also more widely margined with a white flecking. Expanse of wings 70 mm. *Early stages* unknown.— Texas.

Tribe ITHOMYINI.

Butterfly: Males provided in most (all?) genera with an erect row of odoriferous hairs along the subcostal nervure of the hind wings, but no pockets or patches of androconia. Females with relatively long and not enlarged fore tarsi. *Egg*: (Not known sufficiently to distinguish them from Limnaini.) *Caterpillar at birth*: The body segments provided with no other elevations than those on which the ranged bristles are seated. *Mature caterpillar*: Body furnished with fleshy short and stout appendages and also with small papillae; markings transverse and longitudinal. Feeds on Solanaceae. *Chrysalis*: Not dorsally tumid on abdomen, the mesothorax unusually prominent.

Synopsis of the genera.

1. DYNOTHEA. *Butterfly*: Last joint of palpi minute. Fore wings opaque, less than twice as long as broad. *Egg*: Unknown. *Caterpillar at birth*: Ranged appendages short, slightly bent, continuing into the second stage. *Mature*

caterpillar: Naked and without appendages (?). *Chrysalis:* Plump, with strongly protuberant wing-cases and mesonotum.

2. MECHANITIS. *Butterfly:* Last joint of palpi minute. Fore wings opaque, much more than twice as long as broad. *Egg:* Imperfectly known; laid in clusters. *Caterpillar at birth:* Ranged appendages moderately long, pointed, not restricted to first stage. *Mature caterpillar:* Furnished with a series of thick fleshy appendages on the lower sides of the body. *Chrysalis:* Elongate with somewhat protuberant mesonotum and scarcely protuberant wing-cases.

3. DIRCENNA. *Butterfly:* Last joint of palpi conspicuous. Fore wings transparent, much more than twice as long as broad. *Egg:* Unknown. *Caterpillar at birth:* Ranged appendages long, slightly bent, restricted to first stage. *Mature caterpillar:* Covered with pile. *Chrysalis:* Similar to that of Dynothea.

Two species of HYMENITIS have been credited to our southern border, but probably on insufficient grounds: *diaphana*, said to occur "from Brazil to Virginia"; and *phono* given by Geyer as from Florida; neither assertion has been verified.

Dynothea Reakirt.

Butterfly: Palpi thinly clothed, with first and second joints subequal and long, third very short; antennae half as long as fore wings. Wings opaque; fore wings less than twice as long as broad, the recurrent nervule in discoidal cell originating between the two lower subcostal nervules. Femur of male longer than the coxa. *Egg:* Unknown. *Caterpillar at birth:* Ranged appendages shorter than in the other genera, slightly bent, continuing into the second stage. *Mature caterpillar:* Naked and without appendages (?), with a stigmatal band. *Chrysalis:* The wing-cases are strongly protuberant along the ventral line and the mesonotum similarly protuberant along the dorsal, in each case roundly rectangulate; and thereby, as seen on a side view, the anterior end of the body is bent at an angle of nearly 80°; abdomen short conical.

D. lycaste Fabr. (*Ceratinia iphianassa* Doubl. etc.). *Butterfly:* Wings tawny orange, with similar markings above and beneath. Fore wings mostly blackish outside the discoidal cell and interspace beneath it, with a large oblique long squarish black spot in the cell, large unequal oval orange spots in the median interspaces and a large oblique broad saffron band nearly crossing the apical half of the wing. Hind wings margined with a narrow lunulate black band; an equally broad black loop open on the inner margin crosses the wing enclosing subapically a small black spot at the apex of the cell. Expanse 50 mm. *Early stages:* Unknown. — Southern California.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE. — XXXV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Coryphista badiaria Hy. Edw.

Egg. Elliptical, rounded, two sides flattened, wedge shaped, the large end truncate for a small space, all without sharp angles; coarsely hexagonally reticulate, the lines raised, broad, rounded, the spaces between forming flat hexagons, rather regular; all pale yellow; size .9 × .6 × .5 mm.

Stage I. Head round, erect, scarcely bilobed; luteous, shining; ocelli black, mouth brown; width about .4 mm. Body cylindrical, normal, short, the segments not elongate but the ends somewhat contracted; all translucent yellowish, the food showing faintly green; not shining. No shields differentiated; tubercles and setae minute, black. Segments slightly folded, whitish; feet pale, normal; no markings. Later very faint, fine, whitish subdorsal and lateral lines, joints 10 to 13 subdorsally shaded with dull reddish.

Stage II. Head round, thick, erect, slightly bilobed, pale pinkish flesh color; width .7 mm. Body moderate, rather thick, incisures a little depressed, uniform, smooth. Tubercles slightly elevated, a little blackish; setae rather long, dark. Olivaceous green, a fine addorsal whitish line; a broad, subdorso-lateral, olive gray shade-band; substigmatal band broad, whitish; venter dusky shaded. Feet pale sordid green, normal.

Stage III. Head rounded, bilobed, free, pale red, yellowish in the sutures; width 1.2 mm. Body cylindrical, robust, uniform, smooth; black, shields a shade redder; dorsal space diluted luteous. Addorsal and subdorsal broken, narrow obscure white lines; broad stigmatal white line, from tubercle iii to v, geminate, luteous filled, yellow about the spiracle; a white line to anal foot. Venter somewhat diluted. Tubercles small, round, black; feet black, abdominal claspers reddish. Setae dark, fine, obscure. Not shining.

Stage IV. Head shining orange; width 2 mm. Body robust, the ends somewhat smaller. Purplish black, dorsal lines broken, nearly absent; stigmatal white band enlarged on the segments a little, yellow at the spiracles, luteous dotted centrally. Feet, except the shield of joint 13, reddish. Tubercles small, black; a white line on the foot joint 13.

Pupation in the ground, or between leaves.

Food plant. The larvae were found only on *Berberis repens* and would eat no other plant. Several brooded; imago emerged June 18th. Eggs from captured ♀♀ June 20 and July 7th. Larvae from various places in the foothills of the Rocky Mountains; back of Golden and Boulder, Colorado and in the Platte Canyon.

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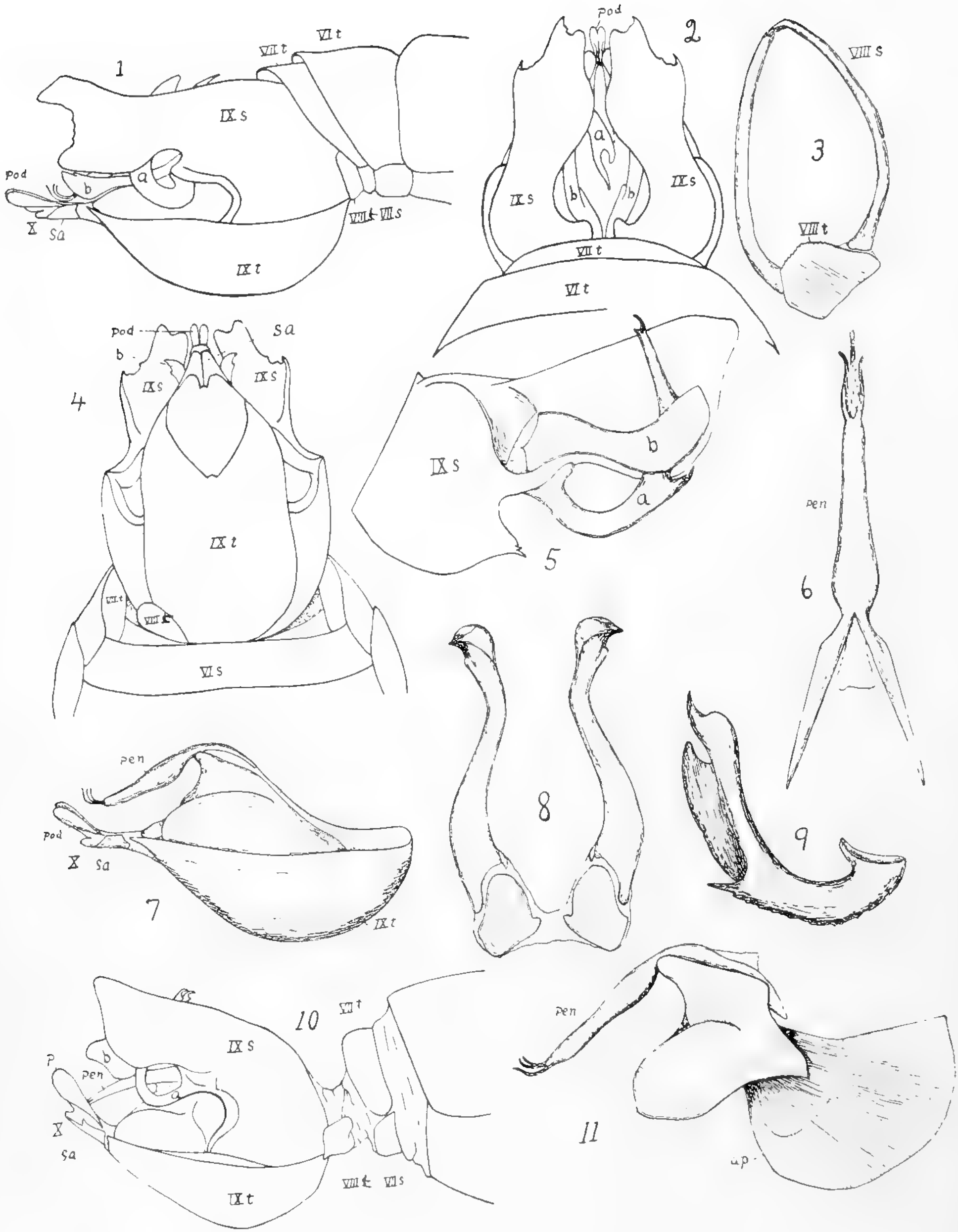
CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of ech month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.



INVERTED HYPOPYGIUM OF DASYLLIS AND LAPHRIA.

THE INVERTED HYPOPYGIUM OF *DASYLLIS* AND *LAPHRIA*.

BY ROBERT E. SNODGRASS, PULLMAN, WASH.

The Asilid genera *Dasyllis* and *Laphria* present the curious anomoly of having the hypopygium, i. e., the ninth segment of the male, inverted. Figures 1 and 10 clearly show this condition in *D. grossa* and *D. flavicollis*.

The writer is indebted to Professor J. M. Aldrich, of the University of Idaho, for named material on which the following descriptions are based.

The hypopygium consists of a large ovate structure carried by its larger end on a comparatively narrow neck formed of the seventh and eighth abdominal segments and their intervening membranes (Fig. 10). Within the hypopygium is a large cavity, the genital chamber, opening posteriorly. It has a thick swollen floor on which is carried the intromittent organ, and thin dorsal and lateral walls. The dorsal wall presents a large median notch reaching forward almost to the base of the hypopygium. The lateral walls are similarly, but less deeply, notched.

The lower part of the hypopygium is the ninth tergum (IX t.). It consists of a large convex plate, oval to elongate-ovate in ventral view, with the smaller posterior end truncate. The posterior end may be also deeply notched as in *D. grossa* (Fig. 4) or it may be but slightly concave as in *D. flavicollis* and *L. vultur*.

The upper and lateral parts of the hypopygium consist of the ninth sternum (IX s.). On account of the dorsal and lateral notches of the hypopygium, the sternum has the form of a basal semicircular plate with two large dorso-lateral lobes projecting backward (Figs. 1, 2, 4 and 10, IX s.) Each of these lobes carries, within the genital chamber, two pairs of large movably attached appendages (*a* and *b*). One pair (*a*) is lateral and is articulated to the dorsal edge of the lateral notch of the hypopygium (Figs. 1, 5 and 10, *a*). Each of these (Fig. 9) is laterally flattened and strongly curved dorsally, where it ends in one or two heavy claws that project out of the dorsal notch. The other pair (*b*) is dorsal and is born by two lobes at the anterior angles of the dorsal notch of the hypopygium (Figs. 2 and 5, *b*). These appendages (Fig. 8) vary considerably in shape. They are generally bent somewhat laterally. In some species they are expanded basally, in others terminally; in some they are prong-like, in others they are spoon-shaped. In *L. vultur* the tip of each is formed of three plates set at right angles to one another.

The penis (Figs. 6, 7 and 11, *pen.*) is a chitinous tube terminating in three slender prongs. Apparently the seminal passage divides into three tubes at the bases of these and opens by three apertures at their tips. The penis (Fig. 6) is carried on an elevated support (Fig. 7) on the floor of the genital chamber. The three terminal prongs project posteriorly from the latter over the tenth segment. Attached to the interior of the support is a large muscle apodeme (Fig. 11, *ap.*).

On account of the inverted position of the ninth segment, the tenth segment (X) comes to lie below the mouth of the genital chamber instead of, as normally, above it. It is composed of the ordinary characteristic parts. There is a divided suranal plate (*sa*) lying here *below* the anus, and two elongated podical plates (*pod*) lying *above* the anus.

The eighth segment is partially rudimentary. It consists of a narrow curved bar forming the dorsal and lateral parts (Figs. 3 and 10, VIII *s*), and of a small plate (Figs. 1, 3, 4 and 10, VIII *t*) applied to the right lower aspect of the base of the hypopygium. The eighth segment is symmetrical in shape but asymmetrical in position. Normally it is almost hidden within the seventh segment (Fig. 1).

The rectum lies in the right side of the body cavity of the hypopygium, turning in mesially at the base of the tenth or anal segment. Hence, the hypopygium must have revolved to the right from above. If this is so, then the small dextro-ventral plate of the eighth segment is probably the eighth tergum which has revolved through only about 150°. The seventh segment is normal, the revolution having taken place entirely back of it. It is small and is mostly concealed within the sixth segment.

Explanation of Plate.

Fig. 1, *Dasyllis grossa*, lateral view of hypopygium; Fig. 2, *D. grossa*, dorsal view of hypopygium; Fig. 3, *D. grossa*, eighth segment; Fig. 4, *D. grossa*, ventral view of hypopygium; Fig. 5, *D. posticata*, interior view of right half of ninth sternum, showing attachments of appendages *a* and *b*; Fig. 6, *D. posticata*, dorsal view of penis; Fig. 7, *D. grossa*, lateral view of ninth tergum and penis, and tenth segment; Fig. 8, *D. grossa*, appendages *b*; Fig. 9, *D. grossa*, appendage *a*; Fig. 10, *D. flavicollis*, lateral view of hypopygium; Fig. 11, *D. flavicollis*, lateral view of penis and its support. VI *t*, VII *t*, VIII *t*, IX *t*, sixth to ninth abdominal terga; VI *s*, VII *s*, VIII *s*, IX *s*, sixth to ninth abdominal sterna; X tenth segment; *a*, lateral appendage of ninth sternum; *b*, dorsal appendages of ninth sternum; *pen*, penis; *ap*, apodeme; *sa*, suranal plate; *pod*, podical plates.

THE ASSOCIATION OF COCCIDAE.

BY GEO. B. KING, LAWRENCE, MASS.

The present paper is intended to give a list of such *Coccidae* as are known to the writer from published or unpublished records to have been found associated together on the same food plant, or in ants' nests, etc. Incomplete as it must be, it will show to some extent the difficulty which accompanies the identification of species of the same genus so found, these being often closely allied.

Furthermore it will be seen how difficult it is to treat the infested plants with insecticides, for as a matter of fact in some instances, the treatment for one would not do for the other, therefore various means have to be adopted.

It has been asked in the writers hearing many times "are varieties produced by the association of two or more species living together on the same food plant." Such questions are usually asked by individuals who having read somewhat superficially the writings of popular authors upon evolution and general biology assume a more perfect knowledge than the entomologist who has made such investigations the study of his life.

So far as I know no varieties have been found in the *Coccidae*, which could be said to have been the result of two or more species living together.

There are however means whereby this could be proved, provided one had the time to devote to it, and the results would no doubt be of much value to science.

I well remember many years ago while in conversation with Dr. Hagen then at Harvard, what he said to me when I asked him if in his opinion there were any new species of recent origin. His reply was "you will not live long enough to find one." We, of course, are constantly finding and describing new species and varieties; but these we believe have been in existence for a long time but only of recent discovery and are more frequently found in localities which have been little worked up. It would indeed be of much interest if some one would try to find whether or not a male coccid would mate with a female not of its own kin.

The following citations for the most part are records made by Prof. Cockerell although several are from various authors including myself. Some appear here for the first time.

Lecanium pseudhesperidum Ckll. and *Diaspis boisduvalii* Sign. Associated together on *Cattleya* in a greenhouse at Ottawa Canada. The later species *D. boisduvalii* has hitherto been placed in the genus *Aulacispis*. Prof. Cockerell writes me that Mr. Newstead shows that it should be placed in the *Diaspis*.

Lecanum hesperidum L. *Pulvinaria floccifera* West (*P. brassiae*) and *Hemichionaspis aspidistrae* Sign. Cited as

Chionaspis braziliensis Sign. are found together on leaves of an orchid in Trinidad.

Lecanium hesperidum L. and a *Pulvinaria* sp. on leaves of "*fitoloca*" at Monterey, Mexico.

Lecanium baccharidis Ckll. and *Mytilaspis perlonga* Ckll. on twigs and branches of *Baccharis* at Campinas, Brazil.

Lecanium longulum Dougl. and *L. melaleucae* Mask. on leaves of *Monstera deliciosa* in the Harvard botanical greenhouse at Cambridge, Mass.

Lecanium sp. Ceraplastes sp. young of *Aspidiotus articulatus* Marg. and *A. personatus* Comst. on leaves of *Anacardium occidentalis* at Kingston, Jamaica.

Lecanium sp. *Ceroplastes floridensis* Comst. and *Parlatoria* sp. on *Anthurium lanceolatum* at Kingston, Jamaica.

Lecanium mangiferae Green and *Vinsonia stellifera* Westw. on leaves of *Bambosa malaccencis* at Kingston, Jamaica.

Lecanium mangiferae Green. *Saissetia oleae* Bern. *Ceroplastes floridensis* Comst. *Vinsonia stellifera* Westw. and *Aspidiotus personatus* Comst. on leaves of *Mango* in Manchester square, Kingston, Jamaica.

Lecanium hesperidum L. and *Saissetia oleae* Bern. on *Hippeastrum equestre* at Kingston, Jamaica.

Eulecanium quercitronis Fitch and *Chionaspis americana* Johns on *Ulmus americana* at Springfield, Mass.

Eulecanium caryae Fitch and what I take to be *E. perseae* Fabr. on a peach tree at Niagara, Ontario, Canada.

Saissetia oleae Bern. *Ceroplastes floridensis* Comst. and *C. cirripediformis* Comst. on *Lignum vitae* tree at Kingston, Jamaica. *Saissetia hemisphaerica* Targ. and *Orthezia insignis* Dougl. on *Chrysanthemums* at Kingston, Jamaica.

Saissetia hemisphaerica Targ. and *Dactylopius longispinus* Targ. on house fern at Las Cruces, New Mexico.

Saissetia coffeae? Walk. and *Ceroplastes myricae* L. in Assam India on tea. *S. coffeae* may yet be found to be a valid species. I received an adult female scale on leaf of coffee from Mr. Adolph Hempel of Brazil. The scale seems different from those of *S. hemisphaerica* and *S. filicum* but more material must be obtained before a decision can be made.

Saissetia hemisphaerica Targ. and *Aspidiotus aurantii* Mack on *Areca catechu* grown in pots at Cavalieris Penn., Jamaica.

Saissetia hemisphaerica Targ. *Diaspis zamiæ* Morgan (this is recorded as *Aulacaspis elegans* Leon but Mr. Newstead shows it to belong to the *Diaspis* Cockerell in litt.) and *Dactylopius longispinus* Targ. on *Cycas revoluta* under glass at Springfield, Massachusetts.

Ceroplastes myricae L. and *Fiorinia theae*? on tea plant in Assam, India.

Ceroplastes irregularis and *Phenacoccus simplex* King, on *Atriplex confertifolia* and *A. polycarpa*? at Lone Pine, California.

Icerya rosae and *Ceroplastes depressus* Ckll. found under bark of *Lignum vitae* tree at Kingston, Jamaica.

Icerya montserratensis and *Ischnaspis longirostris*. Sign on a palm in Trinidad.

Aclerda japonica Newst. and *Antonina socialis* Newst. under the leaf sheath of

Arundinaria japonica under glass, Broxhourne Herth, England.

Ripersia flavola Ckll. and *R. candidata* King, in ants nests in Massachusetts.

Aspidiotus articulatus Morg. *Mytilaspis becki* Newm. and *Chionaspis citri* Comst., on leaves of lime in Trinidad.

Aspidiotus articulatus Morg. and *Chrysomphalus aonidum* L. on orange at Tampico, Mexico.

Aspidiotus yuccarum Ckll. and *Dactylopius dasylirii* Ckll. at the base of leaves of *Yucca elata* at Mesilla Park, N. M.

Aspidiotus ancylus Putn. and *A. fernaldi* Ckll. on *Gleditschia triacanthos* in Charlesbank Park. Mass.

Aspidiotus hederae Vall. and *Diaspis zamiae* Morgan, on *Cycas revoluta* in a greenhouse at Lawrence, Mass.

Aspidiotus personatus Comst. and *Howardia biclavis* Comst. on the skin of orange (fruit) from Colima, Mexico, quarantined at San Francisco, California.

Aspidiotus cryptoanthus and *Asterolecanium variolosum* Ratz. var *japonicum* Ckll. on *Quercus glandulifera* from Japan.

Aspidiotus orientalis Newst and *Ceroplastes myricae* L. on *Cycas revoluta* in Assam, India.

Aspidiotus candidulus Ckll. and *Xerophilaspis prosopidis* on leaves and twigs of *Prosobis velutina* at Tuscon, Arizona.

Aspidiotus forbesi Johns and *A. ancylus* Putn. on crab apple and plum in Kansas.

Aspidiotus aurantii Mask. and *Asterolecanium variolosum* Ratz recorded as a *Planchonia* on oak at Sidney, New South Wales.

Aspidiotus personatus Comst. and *Chrysomphalus aonidum* L. on leaves of *Anacardium occidentale* at Kingston, Jamaica.

Aspidiotus aurantii Mask. and *Chrysomphalus aonidum* L. on *Areca catechu* grown in pots at Cavalieris Pen., Jamaica.

Aspidiotus articulatus Morg. and *Ceroplastes floridensis* Comst. on leaves of *Brunfelsia americana* at Kingston, Jamaica.

Aspidiotus articulatus Morg. and *A. personatus* Comst. on *Cassia fistula* at Kingston, Jamaica.

Aspidiotus articulatus Morg. *A. personatus* Comst. *Pulvinaria cupaniae* Ckll. and *Diaspis* or *Chionaspis* sp. on leaves of *Chrysophyllum cainito* in Manchester Square, Kingston, Jamaica.

Aspidiotus articulatus Morg. *A. personatus* Comst. *Chrysomphalus aonidum* L. and *Ceroplastes floridensis* Comst. on *Ficus* tree in the yard of the Museum at Kingston, Jamaica. All of the four species cited were also found on a young banana tree out of doors in Jamaica.

Aspidiotus articulatus Morg. *A. personatus* Comst. and *Vinsonia stellifera* Westw. on leaves of *Mangifera indica* at Kingston, Jamaica.

Aspidiotus sp. and *Dactylopius longispinus* Targ. on green mangoes at Kingston, Jamaica.

Aspidiotus articulatus Morg. *A. personatus* Comst. and *Chrysomphalus aonidum* L. on leaves of *Nerium oleander* at Kingston, Jamaica.

Aspidiotus articulatus Morg. and *A.*

personatus Comst. on leaves of *Olea hispanica* in the Parade garden in Jamaica and the same species on leaves of *Persea*, also on leaves of *Punica granatum*, *Aralia guilfoylei*, and *Aperba tibourbou* in Jamaica. The same species together with *Asterolecanium* (*olim Asterodiaspis pustulans* Ckll. on leaves of *Capania edulis* at Kingston Jamaica. The same *Aspidiotus* on *Guaiacum officinola* and on leaves of *Erythrina umbrosa* with *Ceroplastes floridensis* Comst., at Kingston, Jamaica. The same three species were found on *Melicocca bijuga* in Jamaica.

Aspidiotus articulatus Morg. *Chrysomphalus aonidum* L. and *Pulvinaria capaniae* Ckll. on *Bignonia magnifica* in Jamaica.

Aspidiotus personatus Comst. *A. articulatus* Morg. and *Chrysomphalus aonidum* L. on *Jasminum pubescens* and *A. personatus* and *A. articulatus* on *Lawsonia inermis* and *Thevetia neriifolia* at Kingston, Jamaica.

Diaspis arizonicus Ckll. and *Xerophilaspis prosopidis* Ckll. on leaves and branches on *Prosopis velutina*, Wooton near Kellners Ranch several miles west of Phoenix, Arizona.

Diaspis celtidis Ckll. and *Pulvinaria innumerabilis* Rathv. on Celtis at San Antonio, Texas.

Mytilaspis glonveri Pack, *Chionaspis citri* Comst. and *Chrysomphalus aonidum* L. on leaves and fruit of orange at Tampico, Mexico.

Mytilaspis bambusicola Ckll. and *Asterolecanium bambusae* Boisd. on stems of bamboo at Campinas, Brazil.

Mytilaspis concolor Ckll. and *Solenophora coloradensis* Ckll. at Canon City, Colorado on twigs and stems of *Atriplex canescens.*

Mytilaspis ulmi L. *Chionaspis furfurus* Fitch and *Phenacoccus dearnessi* King, on an old hawthorn tree at London, Ontario, Canada.

Mytilaspis ulmi L. and *Asterolecanium variolosum* Ratz on oak twigs from Germany.

Mytilaspis becki Newm. and *Aspidiotus articulatus* Morg. on twigs of *Murraya* at Kingston, Jamaica.

Addenda by Professor Cockerell.

On a single guava (*Psidium*) tree at Kingston, Jamaica, I found

Saissetia oleae. *Pulvinaria cupaniae*

" *hemisphaerica.* *Vinsonia stellifera*

Aspidiotus articulatus. *Chrysomphalus aonidum*

Aspidiotus personatus. *Ceroplastes floridensis.*

Ripersia fimbriatula and *R. conpusella* together in nests of *Lasius* at Las Vegas, N. M.

GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — IV.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Mechanitis Fabricius.

Butterfly: Palpi thinly clothed, with first and second joints subequal and long, third very short; antennae more than half as long as fore wing. Wings opaque; fore wing twice as long as broad, the recurrent nervule in discoidal cell originating between the lowest subcostal and upper median nervules; precostal nervure of hind wings forked. Femur of male of same length as coxa. *Egg*: Tall, pointed above, with strong ribs and delicate transversals; laid in open clusters of about a dozen. *Caterpillar at birth*: Segments of body somewhat deeply separated, anteriorly tumid below the spiracles; ranged appendages moderately long, straight (?), pointed, perceptible in after stages. *Mature caterpillar*: Provided with an infrastigmatal series of fleshy prominences, not prominent on the thoracic, conical and pointed on the abdominal segments, besides transverse series of papillae next the incisures and a pair of fleshy prominences on the sides of the first thoracic segment; transversely banded. *Chrysalis*: The wing-cases show a gentle arcuation along the ventral line, but the mesonotum is roundly prominent on the dorsal line; anterior extremity, as seen from the side, very acutely pointed; abdomen long conical. (μηχανητής, a contriver; the significance is not clear.)

M. californica Reak. *Butterfly*: Wings with nearly the same markings above and beneath. Fore wings brownish black; a basal streak along the median nervure and two rounded spots near inner angle orange-tawny; a yellow spot across the cell near its apex, a more or less interrupted oblique belt across the apical half of the wing and an oblong subapical spot also yellow. Hind wings orange tawny with an entire broad mesial band and narrow border of brownish black; beneath a 2-shaped blackish brown spot, much enlarged above below the middle of the apical half of costal margin. Expanse 60 mm. *Early stages*: Unknown. — Southern California.

Dircenna Doubleday.

Butterfly: Palpi thickly clothed, with first and second joints subequal and long, the third short, but not minute; antennae fully half as long as fore wing. Wings nearly transparent; fore wing twice as long as broad, the recurrent nervule in discoidal cell as in Mechanitis; precostal nervure of hind wings simple: Femur of male of same length as coxa. *Egg*: Unknown. *Caterpillar at birth*. Body cylindrical; ranged appendages long, slightly bent, seated on papillae. restricted to first stage. *Mature caterpillar*: Head round. Body cylindrical, covered with pile and spotted. *Chrysalis*: As in Dynothea.

D. klugii Hübn. *Butterfly*: Wings with nearly similar markings above and beneath, nearly transparent but somewhat infumated, and with brown nervures. Fore wings with two arcuate series of large oval clearer paler or amber-like spots in the interspaces beyond the cell, subparallel to outer margin, a dusky margin and a pair of dusky dashes enclosing a broad oblique clearer band between them near apex of cell; an orange stripe with an enclosed broad black stripe following the inner margin. Hind wings margined narrowly with black, in which, beneath, are a series of transverse white dashes. Expanse 80 mm. *Early stages*: Unknown. — Southern Texas.

Subfamily HELICONINAE.

Butterfly: Head unusually broad. Palpi small, compressed, the fringes moderate. Antennae naked or sparingly scaled, exceptionally long, straight, the club well marked, sometimes abrupt. Fore legs of both sexes excessively atrophied, short and sparsely clothed with short hairs. Fore wings very long and narrow: none of the nervures swollen at the base; internal nervure absent; cell of hind wings short and closed or open; costal nervure extending to the outer margin. Abdomen exceptionally long and slender in most genera. Highly variegated and of lively colors, but rarely with delicate markings, generally similar above and beneath. Females with a pair of extensile club-shaped stink-pads at tip of abdomen, between the two last segments, brought into use when seized. Males with a similar pair on the inner side of the claspers. *Egg*: Thimble-shaped, considerably higher than broad, the outer portion of the domed summit with unusually large cells, the more or less direct continuation of the large quadrangular cells upon the sides. *Caterpillar at birth*: Head scarcely larger than segments following. Body cylindrical, scarcely tapering, uniform in color; ranged appendages very long, slender, and arcuate and generally, in our species always, clubbed. *Mature caterpillar*: Head armed with long and slender aculiferous coronal spines. Body cylindrical, submoniliform, more or less and delicately spotted or marmorate or blotched on the sides, armed with series of exceptionally long and slender, briefly and sparsely aculiferous spines. Feeds only on Passifloraceae, whence Müller in Brazil terms these insects maracujá butterflies. *Chrysalis*: Of very bizarre appearance; with highly conspicuous prominences in several places producing the most grotesque and distorted forms; especially are the ocellar prominences strongly compressed and generally excessively elongate and serrate, the wing-cases are excessively medioventrally protuberant and the sides of the dorsal surface of the third (sometimes second and third) abdominal segments prominent, produced or lamellate; thorax and abdomen rather deeply separated. In coloring much variegated.

Contains but a single tribe, Heliconini.

Synopsis of the genera.

1. APOSTRAPHIA. *Butterfly*: Fore wing distinctly more than twice as long as broad, its cell fully half as long as wing; cell of hind wing closed. *Egg*: Tapering only on the upper third. *Caterpillar at birth*: Three principal rows

of ranged appendages on each side, the uppermost laterodorsal, the lowermost with two appendages to a segment, all springing from flattened tubercles. *Mature caterpillar:* Spines of head slender, tapering throughout; uppermost spines of body much longer than the segments. *Chrysalis:* Frontal tubercles excessively long, ribbon-like, serrate above; antennal joints spined; abdominal prominences terminating in spines.

2. COLAENIS. *Butterfly:* Fore wing distinctly more than twice as long as broad, its cell fully half as long as wing; cell of hind wing open. *Egg:* Unknown. *Caterpillar at birth:* Ranged appendages springing from elevated tubercles. *Mature caterpillar:* Uppermost spines of body scarcely longer than the segments. *Chrysalis:* Frontal tubercles large but not elongate; antennal joints not spined; laterodorsal prominences of abdomen beyond third joint large, compressed, subquadrate.

3. AGRAULIS. *Butterfly:* Fore wing not more than twice as long as broad, its cell much less than half as long as wing; cell of hind wing open. *Egg:* Tapering from the middle upward. *Caterpillar at birth:* Three principal rows of ranged appendages on each side, all with one appendage to a segment and all springing from elevated tubercles. *Mature caterpillar:* Spines of head stout, scarcely tapering; uppermost spines of body longer than the segments. *Chrysalis:* Frontal tubercles large but not elongate; antennal joints tuberculate but not spined; laterodorsal prominences of abdomen beyond third joint small, conical.

Apostraphia Hübner.

Butterfly: Palpi very slender, very thinly haired; antennae as long as the body, gradually clavate. Fore wings more than twice as long as broad with well-rounded tip, the cell more than half as long as the wing; cell of hind wings closed, the anal angle rounded. Fore tarsus of ♂ very short; pulvilli and paronychia present. *Egg:* Subcylindrical, tapering considerably only on the upper third, the lateral cells less than twice as broad as high. Laid singly.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXVI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Synomila subochrearia Hulst.

Egg.—Elliptical, sides roundedly flattened, truncation rounded, a little oblique, outline in general a little irregular, no end depression. Reticulations circular-hexagonal, rounded, raised, the cell areas forming round pits like a thimble all over the surface. Pale yellowish pink, turning darker. Size .6 × .5 × .4 mm. Laid loose, easily rolling around.

Stage I.—Head rounded, erect, slightly bilobed, free, dark dull brown; width .3 mm. Body moderate, normal, translucent sordid whitish, marked with sordid vinous brown.

A greenish dorsal line, dotted on the rather numerous, obscure annulets, grayish in tone, diffuse outwardly with traces of a similar, single, subdorsal line; five broad, transverse, vinous, segmentary bands on joints 5 to 9. Anal feet spreading, the abdominal feet all pale. Tubercles and setae minute, inconspicuous, short, capitate. Thorax dorsally diffusely shaded in brown.

Stage II.— Head smoky luteous, darker except in two lines from the clypeus on each lobe; width .4 mm. Body normal, moderate, sordid luteous with five broad, transverse, vinous, segmentary bands as before, united by numerous fine, evenly spaced, longitudinal lines of the same color, fainter at the ends, addorsal, subdorsal, lateral, etc. Tubercles whitish with short, capitate setae also whitish, the enlarged ends looking like dots on the body. Segments finely annulate.

Stage III.— Head rounded bilobed, brown, pale mottled, a pale curved line on each lobe above; dotted by the white capitate setae; width .6 mm. Body whitish with fine red-brown lines, slightly waved, about as wide as the spaces, blotched on the diffuse transverse bands of joints 5 to 9. Feet dark. Finely annulate; appears dotted by the white capitate setae.

Stage IV.— Head rounded, erect, rather strongly bilobed, brown, black on the face, pale, dark mottled on sides and vertex; setae pale, short, capitate; width .85 mm. Body moderately robust, the ends contracted, normal, segments rather numerously annulate especially at the ends; subventral fold ridged, prominent on the posterior edges of the segments. Tubercles i and ii well separated, ii on a slightly prominent annulet. Nearly uniformly entirely dark brown; segments a little lighter patched dorsally with traces of a pale, narrow, dorsal line, on each side of which are rather irregular, faintly traced, blackish markings intersegmentally, forming a broad, geminate dorsal band. Feet short, dark; setae with pale capitate tips, short. Subventral ridge marked and blotched in pale. After being in this stage two weeks the larvae were thick and robust, tapering from joint 5 to the small head. Dark brown, finely annulate, shaded in paler on the back; subventral fold pale and blotched broadly in pale centrally on the segments. Marks all obscure.

Stage V.— Head rounded bilobed, erect or with the apex advanced, clypeus depressed. Brown-black, apices of lobes lighter brown mottled; setae short, white, capitate; width 1 mm. Body robust, attenuated somewhat before, finely annulate. Dark brown-black, variegated with obscure tessellated markings in lighter brown in dorsal, diamond-shaped patches, terminated in obscure black X-marks in the incisures and a black subdorsal line. All the markings are clouded, faint and mottled. Subventral fold prominent. Setae short, pale, capitate. The dorsal tessellations are palest on joints 5 and 6, somewhat ring shaped on joint 11.

Larvae from Golden, Colorado, eggs July 7th. The larva grew slowly and died October 27th, but seems to have been in the last stage. It is remarkable, however, that the capitate setae should persist so long. The larva was fed on Polygonum; natural food-plant not determined.

PSYCHE

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CAMBRIDGE ENTOMOLOGICAL CLUB.

The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

NOTES ON HYBRIDS OF SAMIA CYNTHIA AND ATTACUS PROMETHEA.

CAROLINE GRAY SOULE, BROOKLINE, MASS.

Having been told that it was difficult, if not impossible, to obtain fertile eggs from cross-mating these species I carefully watched the normal mating of both species for suggestions which should help in obtaining hybrids.

I found that the males were so excited by the odor of the females that they would fasten their claspers on any part of a female's body or even on each other. Therefore I put female *cynthias* in a cage toward which the wind blew from a cage containing a female *promethea*, and introduced male *prometheas*. After a few minutes of the wild flight and quivering of the wings characteristic of the mating of *promethea* the males mated the *cynthia* females as readily as if they had been of their own species.

The same experiment was tried with *cynthia* males and *promethea* females and with equal success so far as mating went.

Of the eggs I sent away more than three fourths and of these I know the results of those sent Miss Eliot only.

Only two of my eggs laid by *cynthia* females hatched, and the larvae were normal *cynthia* larvae except that in the last stage they were greener.

Of the eggs laid by *promethea* females all mine and Miss Eliot's hatched and gave great variety, though we divided them into "the *promethea* form" and "the *cynthia* form," for convenience in referring to them.

There were more of the "*promethea* form" and these were normal *promethea* larvae except that in the last stage some had very noticeable blue patches around the black dots of the lateral and stigmatal rows. Rearing them side by side with a brood of normal, pure *prometheas* I could see no other difference.

The "*cynthia* form" larvae were like the *prometheas* in the first two stages, but after the second moult they could be separated from those, though they varied among themselves.

Their heads were yellow barred with black. Some bodies were yellow with transverse black lines, black tubercles on the first two and anal segments, and yellow tubercles elsewhere. The legs were black, the props yellow.

Others had two yellow tubercles,

rather larger, on the third segment and one bifid, larger, yellow tubercle on the eleventh segment. Part of the dorsal tubercles, on the abdominal segments, were yellow, part black, and part were yellow ringed with black. There was no regularity in the distribution of coloring, the yellow tubercles being sometimes on one side, sometimes on both, sometimes opposite, sometimes at one end, sometimes at the other, sometimes more on one side than on the other.

After the third moult the head was yellow with two black spots, and sometimes two black dots. The body was almost white, the first and last segments being yellow. The first segment had six black tubercles, shaped like *cynthia's*; the second segment had two large yellow tubercles ringed with black on the dorsum and two smaller black ones on each side; the third segment had two large yellow dorsal, and four smaller yellow tubercles ringed with black, and the abdominal segments were like this except the eleventh which had one large dorsal tubercle of yellow, and the other four tubercles smaller, yellow ringed with black; and the anal segment which had two rather large tubercles, yellow ringed with black, on the dorsum, one black one on each side below these, and two black ones on the anal plate. The legs were yellow, the props yellow with a black spot, except the anal props which had the black triangle characteristic of *promethea*.

One larva had the dorsal tubercles on the second segment smooth and shaped like those of *promethea*, the others had these tubercles like *cynthia's*.

After the fourth moult the head was small, yellow with two small black marks, and in one case a black bar across it. The body was pale blue-green with white bloom, except the first and anal segments, the former being yellow, the latter very yellow green like that of *promethea*. The dorsal tubercles on every segment were long and shaped like *promethea's* thoracic tubercles in most cases, though a few had abdominal dorsal tubercles shaped like *cynthia's*. These dorsal tubercles varied much in color, some being pale coral-red, darker on the thoracic segments and growing paler to the eleventh segment; others being pale red on the first six segments, yellow elsewhere; others pale red on a few segments and green with yellow tops on the rest. Some had the thoracic dorsal tubercles ringed with black at base, others had all the dorsal tubercles so ringed; while others had black rings irregularly distributed, not even on opposite tubercles on some segments.

The other tubercles were like *cynthia's*, pale blue ringed with black. The legs and props were yellow with a black dot on each. Two had the anal plate edged with pale blue, like *cynthia's*, and one had this edge almost purple.

One larva had the dorsal tubercles, from the eighth to the anal segment, pale coral-red at tip and vivid yellow-green at base, and the two dorsal tubercles at the top of the anal plate vivid green with a broad black ring on each.

At this stage many died from a disease which killed also many of my *excoecatus* and all my *promethea* larvae, and many of Miss Eliot's hybrids in Nonquitt.

The "*promethea* form" spun after the fourth moult, but most of the "*cynthia* form" moulted a fifth time.

After this moult they were like the last stage, but much greener and with much less bloom.

In this stage more died from the same disease, though each was given a tin by itself.

It is not possible to give in writing any adequate idea of the variety or the beauty of this "*cynthia* form." Both forms came from eggs laid by the same moth and kept separate from other eggs laid after similar mating.

I think that anyone can obtain fertile eggs of hybrids of Attacine moths by following my plan of arranging the cages for mating, although every coition may not result in fertile eggs.

Eggs laid by a female *cynthia* which I found out of doors mated with a male *A. cecropia* failed to give larvae, as did eggs laid by *cynthia* females mated with *promethea* males.

GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — V.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Apostraphia Hübner.

Caterpillar at birth: All the tubercles rounded conical, one to a segment in each row but the infrastigmatal where there are two, three rows on each side besides a supralateral series with appendages less than half as long as the others. *Mature caterpillar*: Head covered with a pair of slender, tapering, slightly recurved spines. Each side of body with three rows of very long and slender straight, very scantily bristled spines, those of the upper rows equal and half as long again as the segments. *Chrysalis*: Body with strong laminate protuberances, the frontal pair excessively elongate, widely divergent, ribbon-like and serrate; antennal joints conspicuously spined; third abdominal segment and the adjoining segments to some extent with it with a laminate laterodorsal flange crowned as the other abdominal tubercles with slender aciculate spines.

Apostraphia charithonia L. (*Heliconia charitonia* Auct.). *Butterfly*: Wings rich blackish brown above, a little paler below. Fore wings crossed by three narrow yellow stripes, the middle one running obliquely from costa, past the tip of cell toward the middle of the outer border; another subparallel to it midway to the tip of wing; the third following the black median vein to its first fork and here bent abruptly parallel to the others. Hind wings with a rather narrow straight yellow band from base of abdomen toward outer angle, striking (on under surface) a couple of pale pink lunules on subcostal nervules; and midway to margin a parallel maculate slender band curving upward outwardly (and beneath enclosing the pinkish lunules). A few dark carneous dots at base of wings and on inner margin beneath. Expanse 80 mm. *Egg*: Broadly truncated at base, narrowly at summit with sides scarcely convex except above and fourteen vertical ribs and few transversals; color yellow. Height 1.3 mm. *Caterpillar at birth*: Body uniform pale reddish brown, the head slightly paler, without appendages, the tubercles a little darker, the hairs black. Length 2 mm. *Mature caterpillar*: Head greenish white with a pair of frontal black spots and long black coronal spines. Body dead white distantly spotted with black or brown, naked but for the exceedingly long piceous spines. Length 35 mm. Feeds on Passiflora. *Chrysalis*: Brown in various shades and streaked with gray and blackish; pronotum and dorsal surface of first three abdominal segments each with a pair of large subdorsal burnished gold spots; sides of abdomen with a web of light colored strigae. Length excluding frontal tubercles 24 mm.— Southernmost United States and southward (Beaufort, N. C., L. R. Gibbes). The male butterflies collect around the female chrysalis for some time previous to eclosion.

Colaenis Hübner.

Butterfly: Palpi slender, rather thinly haired; antennae nearly as long as the body, with short pyriform club. Fore wings more than twice as long as broad, with rounded tip, the cell more than half the length of the wing; cell of hind wings open, anal angle angulate. Fore tarsus of ♂ not much shorter than tibia; paronychia and pulvilli present. *Egg*: Imperfectly known. *Caterpillar at birth*. Imperfectly known. Habits similar to Basilarchia. *Mature caterpillar*: Head with coronal tapering spines; each side of body with three rows of moderately slender not very scantily bristled straight spines, the uppermost about as long as the segments in the middle of the body but not longer at the ends. *Chrysalis*: Frontal tubercles similar to Agraulis but not apically verrucose; third to seventh abdominal segments with large subquadrate laterodorsal laminate flanges, the anterior somewhat larger than the others.

Colaenis julia Fabr. (*Pap. alcionea* Cram.). *Butterfly*: Wings bright reddish fulvous above, saffron-brown beneath, both wings margined above with blackish brown in very varying widths, broadest on fore wings at the upper apex, on the hind wings in middle of outer border; fore wings with a strongly oblique blackish stripe, broadest above, running from the subcostal vein across the apical edge of the cell to the middle of the outer margin. Beneath, at both extremities of the outer margin of hind wings and outer angle of fore wings one or two divided inconspicuous gray-white spots. Expanse of wings 85. mm. *Egg*: Yellow, laid in long rows. *Caterpillar at birth*: Head dark. Body yellow, alternate abdominal segments spotted with white, the bristles black. *Mature caterpillar*: Head black with white sutures and lateral stripes. Body dark brown transversely and narrowly banded above with lighter colors particularly on the thoracic segments; and on the sides broadly dashed with still lighter colors in oblique masses pointed toward the spiracles; spines dark but often light at base. Length 38 mm. Feeds on Passiflora. *Chrysalis*: Dark brown and pale yellowish brown, the former principally on the abdomen, the latter on the thorax and appendages, but the abdomen is longitudinally streaked with the lighter color and the prominences of the thorax marked with the darker. Length— mm.— Southern Florida and Texas and southward.

Colaenis delila Fabr. (*Pap. cillene* Cram.). *Butterfly*: [unfinished].

Agraulis Boisduval.

Butterfly: Palpi with swollen second joint, densely clothed and rather thickly haired; antennae much shorter than the body with obtuse short subspatulate club. Fore wings not more than twice as long as broad with bluntly angulate tip, the cell less than half the length of the wing; cell of hind wing open. Fore tarsus of ♂ nearly as long as tibia; paronychia and pulvilli absent. *Egg*: Subconoidal, tapering distinctly from near the base upward, the lateral cells twice as broad as high. Laid singly. *Caterpillar at birth*: All the tubercles supporting the longest appendages elevated conical and one to a segment in each row; of which there are three on each side besides a supralateral series with appendages not more than a tenth as long as the others. *Mature caterpillar*: Head crowned with a pair of stout scarcely tapering recurved spines. Each side of body with three rows of rather slender, scantily bristled spines, those of the upper row equal and a little longer than the segments. *Chrysalis*: Frontal tubercles not elongate, a little divergent, compressed laminate, the edge verrucose; joints of antennae with slight but unarmed tubercles; third abdominal segment with a laterodorsal flange like but smaller than that of Colaenis, the laterodorsal prominences on the succeeding segments conical and not pronounced.

Agraulis passiflorae Fabr. (*Pap. vanillae* L., *Dione vanillae* Hübn.). *Butterfly*: Wings brilliant orange-red above, the fore wings with black veins thickened apically and six or seven small roundish black spots, those in the cell white-pupilled; hind wings with three black discal spots and a submarginal row of interspacial round orange-red spots set in a black border of the wing. Beneath, the hind wings and apex of fore wing are cinnamon-brown heavily blotched with great elongate dashes of black-edged nacreous silver spots, of which one in the upper subcostal interspace of hind wings is deeply notched, Scales of stink-pad bristle-shaped, arcuate, deeply 2–4 cleft. Expanse 75 mm. *Egg*: Yellow, broadly truncated at base, rounded at summit, with full sides having fourteen vertical ribs and few transversals; height 1.35 mm. *Caterpillar at birth*: Head brown without spines. Body glossy brownish orange, the hairs and tubercles black. Length 3.5 mm. *Mature caterpillar*: Head black with vertical orange stripes and black coronal spines. Body glossy red-orange, longitudinally striped with black and sometimes an infrastigmatal gray or white stripe; spines piceous. Length 37 mm. Feeds on Passiflora and not, as Madame Merian asserted, on Vanilla — whence the incorrect name given by Linné. *Chrysalis*: Very variable in coloration, from buff with greenish markings to black mottled with lighter or darker tints, but in all appear two pink spots at the base of the head, a buff suprastigmatal stripe, and a black sinuate linear depression representing the apex of the cell of the fore wings. Length 30 mm.— Southern portions of the United States and southward (rarely in West Virginia, Pennsylvania, and New Jersey). At least 2-brooded.

Subfamily NYMPHALINAE.

Tribe ARGYNNINI.

Butterfly: Club of antennae very short and abruptly incrassated, subspatulate with no inferior carination or a single one; palpi large and bushy, the terminal joint extremely short; cell of hind wings closed; tibiae and tarsi clothed with spines above. *Egg*: Sides with vertical ribs from base to summit, the whole egg rapidly narrowing in upper half. *Caterpillar at birth*: Hairs of body much longer than the segments, spiculiferous, apically enlarged, aligned throughout. *Mature caterpillar*: Body covered with ranged corneous sparsely aculiferous spines (none of which are mediodorsal) crowned by an independent needle. *Chrysalis*: Abdomen without ridges; head independently swollen; base of wings with a pair of tubercles; cremaster short, stout, and equal.

Tribe VANESSINI.

Butterfly: Club of antennae moderately long, more or less abruptly incrassated, with three inferior carinations; palpi stout with rather coarse and bristling vestiture, the last joint moderately long; second superior subcostal nervule of fore wings arising before the tip of the wing; two (rarely four) rows of spines on under side of last tarsal joint; terminal appendages of male abdomen closely concealed by the last segment. *Egg*: Sides with strongly compressed vertical ribs from base to summit, much higher on upper than on lower half. *Caterpillar at birth*: Hairs of body much longer than the segments, not spiculiferous, distinctly disaligned between thoracic and abdominal segments. *Mature caterpillar*: Body covered with ranged corneous sparsely aculiferous spines (some of which are mediodorsal) crowned by an independent needle. *Chrysalis*: Abdomen without ridges; head independently swollen; base of wings with a pair of tubercles; cremaster long, slender, and tapering.

Tribe NYMPHALINI.

Butterfly: Club of antennae long and very gradually incrassated with four inferior carinations; palpi slender with compact vestiture and very short terminal joint; precostal nervure of hind wings arising opposite the parting of the costal and subcostal nervures; under surface of last tarsal joints with four rows of spines. *Egg*: Sides reticulate with filamentous projections. *Caterpillar at birth*: Hairs of body not longer or scarcely longer than the segments, the ranged papillae dissimilar in size. *Mature caterpillar*: Body furnished irregularly with denticulate or stellate tubercles. *Chrysalis*: Abdomen without ridges; head independently swollen; base of wings with only a single tubercle; mesonotum with a striking median prominence.

Tribe APATURINI.

Butterfly: Club of antennae long and gradually incrassated with three inferior carinations; palpi with compact vestiture, the terminal joint very short; precostal nervure of hind wings arising beyond the parting of the costal and subcostal nervures; under surface of last tarsal joints with two rows of spines. *Egg*: Sides with vertical ribs from base to summit of nearly equal height throughout, or with vertical series of raised points in the upper part of the egg only. *Caterpillar at birth*: Hairs of body not longer or scarcely longer than the segments, the ranged papillae of similar size. *Mature caterpillar*: Body pilose without spines or tubercles. *Chrysalis*: Dorsum of abdomen either longitudinally conspicuously keeled or transversely ridged.

Subfamily SATYRINAE.

Butterfly: Palpi slender, strongly compressed, heavily fringed with long scale-hairs. Antennae clothed, arcuate, with drooping club never abrupt. Fore legs of both sexes excessively atrophied, very small and furred. Some of the nervures of the fore wings swollen at the base (except in some tropical forms); discal cell of hind wings closed by a strong vein (except in some tropical forms). Texture of wings delicate. Generally of somber coloring with ocellated markings. *Egg*: Subspheroidal, broadest below the middle, either delicately reticulate or with numerous slight vertical ribs. *Caterpillar at birth*: Head much larger than segments following. Abdominal segments tapering slightly from in front backward, longitudinally striped; ranged appendages usually clubbed; if not, then arcuate and (always?) larger in the middle than next the base. *Mature caterpillar*: Head with simple* or no coronal protuberances. Body cylindrical, pilose, longitudinally striped, the last segment bifurcate (except in a few tropical forms). *Chrysalis*: With no conspicuous prominences, whole body well rounded. Abdomen not deeply separated from thorax, with no transverse ridges and no mediodorsal carina; margin of wings generally carinate from basal wing tubercle backward. Ventral surface nearly straight.

Only a single tribe, Satyrini, occurs within our district.

Tribe SATYRINI.

Butterfly: Of moderate or small size. Some of the veins of the fore wing swollen at the base; hind wings with discal cell closed and only a slight or no precostal cell. *Egg*: (Distinction from other tribes unknown.†) *Caterpillar at birth*: (Distinction from other tribes unknown.‡) *Mature caterpillar*: Simply pilose, without fasciated hairs and without lateral spines on the head; forks of last body segment always present and rarely of excessive length. Solitary in life, and mostly nocturnal in habit. *Chrysalis*: No distinction from other tribes noted.

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* In Dynastor only (one of the tropical Brassolini) they appear to be spiniferous.

† The only egg of the other tribes known is that of Brassolis which is very much shorter than in any Satyrini known.

‡ The only caterpillars just from the egg of the other tribes yet published are two of Brassolini known only by insufficient figures.

Subfamily LIBYTHEINAE.

Butterfly: Palpi of excessive length, even exceeding that of the thorax (except in some exotic forms), the fringe short. Antennae clothed, gently arcuate, the club gradual. Fore legs of ♂ atrophied, of ♀ nearly normal but abbreviated. None of the nervures of the fore wings swollen at the base; discal cell of hind wings closed by a feeble vein. Generally of a dark color with obliquely transverse broad dashes or blotches of white or orange. *Egg*: Elliptic, much higher than broad, more or less produced at apex and truncate at base with high vertical ribs, highest above. *Caterpillar at birth*: Head much larger than the segment following. Body cylindrical, minutely and briefly pilose. *Mature caterpillar*: Head unarmed, no larger than segments following. Body cylindrical, slightly enlarged at the end of the thoracic segments, pilose, longitudinally striped on the sides, the last segment abruptly curved, not furcate. Feeds on Urticaceae and so far as known only on Celtis. *Chrysalis*: Ovate, compressed, with no conspicuous prominences and everywhere well rounded; with no transverse ridges; abdomen mediodorsally carinate. Ventral surface nearly straight.

Contains but a single tribe, Libytheini.

Subfamily LEMONIINAE.

Butterfly: Labial palpi minute, only the minute apical joint surpassing the face. Fore wings with a distinct internal nervure; hind wings scarcely channeled to receive the abdomen, furnished with a precostal nervure, the costal nervure running only to the middle of the costal margin. Fore tarsi of male, with rare exceptions, without spines or claws. Generally (in our species always) spotted or barred above. *Egg*: Foveolae furnished with septae converging from the walls toward the center. *Caterpillar at birth*: Body with chitinous shields, both dorsal and substigmatal, on every segment, to which the piliferous papillae are confined; chitinous annuli only in the subdorsal region. *Mature caterpillar*: Body scarcely onisciform though not greatly elongated, the head relatively large, being at least half as broad as the middle of the body, and at most only partially retractile within the succeeding segment. *Chrysalis*: More or less elongate and more or less angulate, the abdomen more or less conical with protuberant cremaster, the body sparsely clothed with long hairs.

Only a single tribe, Lemoniini, occurs within our district.

Tribe Lemoniini.

Butterfly: Hind wing provided with a well developed basomarginal nervure. *Egg*: Deeply reticulate and filamentous. *Caterpillar at birth*: (Distinction from other tribe unknown.) *Mature caterpillar*: Clothed with longer or shorter hairs or bristles of equal length in all parts of the body and sometimes fasciated. *Chry-*

salis: (No distinction noted from the other tribe, Nemeobiini.)

Subfamily LYCAENINAE.

Butterfly: Labial palpi well developed, porrect, half or more of the middle joint surpassing the face. Fore wings with excessively brief, hardly perceptible internal nervure; hind wings channeled on basal half to receive the abdomen, without precostal nervure, the costal nervure running nearly to the end of costal margin. Fore tarsi of ♂ armed abundantly beneath and at tip with spines. Generally unspotted and without bars above. *Egg*: No converging septae in the foveolae. *Caterpillar at birth*: Body with chitinous dorsal shields of greater or less extent and distinctness only on the first thoracic and last dorsal segments; no substigmatal indurated shields; series of chitinous annuli on the sides of the body. *Mature caterpillar*: Body with rare exceptions (Feniseca) distinctly onisciform; head relatively small, being less, generally far less, than half as broad as the middle of the body, usually completely, always at least partially retractile within the segment behind it. *Chrysalis*: Short, plump, rounded, and nowhere (except in Feniseca) angulate, the abdomen rounded and falling rapidly behind, (excepting in Feniseca) without protuberant cremaster; body sparsely or densely clothed with short hairs or other dermal appendages.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXVII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Deilinia carnearia Hulst. The ♀ type is in the National Museum. A female before me from which eggs were obtained, is not like the type, the ground color of fore wings being ashen, the lines thicker and more diffuse, the one through the discal dot wanting; terminal gray space more angularly bent and edged within with blackish and carneous. An exact mate to it (♀) is in the Museum, bred on Ceanothus in California by Mr. A. Koebele. Others of Koebele's specimens, of which hardly two are alike, are nearer Hulst's type and one ♂ matches it, except that the terminal gray shade is obsolete. I collected an equally variable series of moths with the ♀ that laid the eggs. *D. falcataria* Pack. and *D. perpallidaria* Grote are probably only varieties of this species; if so, the species must be called *falcataria*. But I have not examined the other types.

Egg.—Elliptical, one end strongly depressed, wedge shaped, the sides narrow but not flattened; micropylar end roundly truncate. About 18 longitudinal, parallel lines, stopping sharply at the edge of the truncation, a little confused at the other end; slightly waved, narrow, raised, joined by neat cross lines, similar, forming transversely elongate parallelograms, alternating in successive rows. Fine pores at the joinings of these reticulations. Green, turning sordid crimson. Size .8 × .6 × .4 mm. Hatched in six days.

Stage I.—Head round, not bilobed, mouth pointed; dark brown, not shining, the sutures of the moderate clypeus a trace darker; a pale speck covering epistoma; width .3 mm. Body moderate, normal, cylindrical, smooth. Sordid whitish, becoming green from the food; a dorsal brown stripe, moderately dark and a series of vinous brown connected subventral blotches, forming a line on joints 2–4 and 10–13. Traces of subdorsal and stigmatal paler lines and faint, pale streaking in the lateral space between. Tubercles minute, black; setae rather long, black, not distinctly capitate. Abdominal feet reddish shaded.

Stage II. — Head rounded bilobed, flattish before, spotted thickly with white over the face, but all of vertex and sides of lobes dark brown; width .5 mm. Body cylindrical, rather short and thick, smooth, normal. Tubercles moderate, but setae bristly, black, distinct. Dorsum dark purple-brown, cut by whitish on joint 2 at sides; sides white with two broad, diffuse, dark brown bands, a little dotted, wider than the whitish spaces. Venter broadly dark with narrow subventral and medio-ventral white lines, the latter segmentarily maculate in dark brown. Feet pale lined.

The larvae were unfortunately lost at this point. Others, collected on Ceanothus at the same place appeared as follows: —

Stage III. — Head rounded bilobed, flattened before, erect; whitish, heavily mottled in brown-black, forming large confluent patches at vertex and sides, leaving the face pale with only a few dark marks; width 8. mm. body marked much as in *Endropia duaria*, stage I (Psyche vol. 9, p. 371) so that the larva was at first mistaken for that species.

Stage IV. — Head as before, somewhat thick and disk-like; greenish white, vertex and sides with brown, transversely strigose mottlings, forming a border about the face; width 1.3 mm. Body robust, moderate, smooth; olivaceous-green; addorsal and subdorsal lines white, darker edged, joined by intersegmental white blotches between 5–6 to 7–8; lateral line white, similarly blotched to the diffuse, yellow, substigmatal line. Venter similarly white lined; a series of large, purple-brown, segmentary, subventral blotches. Feet purplish washed; no shields. Tubercles and setae small, black, inconspicuous.

This delicate larva was lost like the former ones, but another was collected at the same place.

Stage V. — Head as before, but the strigose brown markings are pale; width 2.1 mm. Body as before but all white shaded, the stigmatal line concolorous with the others and all the lines but a little whiter than the body. Segmentary subventral blotches on joints 2 to 9, partly pale brown, partly dark. Feet brown shaded; spiracles brown. Tubercles and setae as before.

Larvae on Ceanothus on the foothills back of Golden, Colorado, collected in July. Moths collected at the same place showed considerable variability, as noted above. One of them is scarcely distinguishable from *D. bifilata* Hulst, and I can construct a good series of specimens leading to this species from the moth that laid the eggs. *D. bifilata* is, therefore, probably only another variety of this variable species.

PSYCHE

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GROUP CHARACTERISTICS OF SOME NORTH AMERICAN BUTTERFLIES — VI.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Tribe Eumaeini.

Butterfly: Antennae gradually incrassated, the club hardly distinct, tapering apically; last joint of palpi nearly as stout as middle joint; third superior subcostal nervule of fore wings simple; upper of the two veins closing the cell of same obsolete, the lower complete; apical armature of fore tarsi of male the same as in Theclini. Males with no discal patch of special scales. *Egg*: Unknown. *Caterpillar at birth*: Unknown. *Mature Caterpillar*: Cylindrical, the head fully half as broad as the body; highest portions of body occupying the posterior half of each segment; body clothed with hairs the more important of which are clustered upon longitudinal series of fleshy bosses. *Chrysalis*: Dermal appendages composed of equal compressed twisted ribands, tapering only at the extreme tip.

Tribe Theclini.

Butterfly: Club of antennae distinct, usually unequal throughout; last joint of palpi far slenderer than middle joint; third superior subcostal nervule of fore wings simple; both of the two veins closing the cell of same subobsolete; last tarsal joint of fore legs of male with a pair of spines differing from the others only in being larger and curved. Males with a discal patch of special scales on fore wings. *Egg*: As much depressed above as truncate below, the micropylic pit very deep, the central depressed area rarely including as much as half the entire width of the egg. *Caterpillar at birth*: Head noticeably narrower than the body; last three abdominal segments fused. *Mature caterpillar*: Head one third or more the width of the body, highest portion of body segments at or behind the middle, the posterior slope the more abrupt; body coarsely pilose, the hairs longer along the ridges of the body. *Chrysalis*: Dermal appendages consisting of cylindrical equal hairs tapering only at the tip.

Tribe Lycaenini.

Butterfly: Club of antennae distinct, usually equal throughout; third superior subcostal nervule forked; spines on under side of tarsi comparatively few and ranged in pretty regular series.

Males with no discal patch of special scales. *Egg*: As much depressed above as truncate below, the micropylic pit relatively shallow, the central depressed area including at least half of the entire width. *Caterpillar at birth*: Head nearly or quite as broad as the body; last two abdominal segments fused. *Mature caterpillar*: Head less than one fourth the width of the body; posterior portions of body segments slightly elevated; body covered with stellate piliferous papillae. *Chrysalis*: Dermal appendages consisting of uniformly tapering cylindrical hairs.

Tribe CHRYSOPHANINI.

Butterfly: Club of antennae distinct, usually equal throughout; third inferior subcostal nervule forked; spines on under side of tarsi numerous and clustered irregularly at the sides. Males with no discal patch of special scales. *Egg*: Domed, much less depressed above than truncate below; angles of cells scarcely or not prominent. *Caterpillar at birth*: Head nearly or quite as broad as body; eighth abdominal segment not fused with others. *Mature caterpillar*: Head one half or nearly one half the width of the body; highest portions of body segments at or in front of the middle of the segments, the anterior slope the more abrupt; body clothed uniformly with short pile, or with longer hairs (sometimes springing from bosses) arranged transversely. *Chrysalis*: Dermal appendages short fungiform.

Subfamily PIERINAE.

Butterfly: Antennae straight. Median nervure of fore wings with three branches; hind wings partially enclosing the abdomen. Fore tibiae with no epiphysis; each of the claws bifid; paronychia generally present. Usually of medium size. *Egg*: Tall and slender, greatly tapering above and often below so as to have a slender base, vertically ribbed and trellised throughout. *Caterpillar at birth*: Head free with a retroarcuate posterior dorsal curve. Body cylindrical, with ranged papillae each supporting a single appendage. *Mature caterpillar*: Head free, scarcely if at all smaller than the succeeding segment, with a posteriorly descending surface as in infancy. Body nearly uniform clothed abundantly with small briefly piliferous papillae and generally longitudinally striped; no osmateria on thoracic segments. *Chrysalis*: Anterior extremity ending in a single central conical projection thrust some distance in advance of the base of the antennae, and without ocellar protuberances. Dorsal surface of the abdomen ridged, if at all, along the mediodorsal line; *i. e.* single. Girt crossing the middle of the first abdominal segment.

Tribe RHODOCERINI.

Butterfly: Club of antennae gradually incrassated, cylindrical, apically truncate; palpi very short and moderately stout, the apical joint minute; third subcostal nervule of fore wings with a long fork;

precostal nervure of hind wings short or wanting; middle tibiae shorter than the femora in the male; eighth abdominal segment of male posteriorly produced above. *Egg*: Tapering at base almost as much as above, rounded at each end, vertical ribs numerous, slight. *Caterpillar at birth*: Uppermost ranged appendages laterodorsal, conspicuously longest at the extremities of the body. *Mature caterpillar*: Piliferous papillae subequal, or if very unequal the larger arranged on abdominal segments in transverse series. Body moderately stout, tapering forward, the segments divided into six sections, the head smaller than any part of the body. *Chrysalis*: Wing cases decidedly protuberant ventrally, the tongue and antennae not nearly reaching the uncovered part of the abdomen; prominences of body generally rounded, the head well distinguished by its curves from the frontal projection.

Tribe Anthocharini.

Butterfly: Club of antennae and palpi as in Pierini; third subcostal nervule of fore wing forked near the middle; precostal nervure of hind wing straight; middle tibiae shorter than femora; eighth abdominal segment of male posteriorly produced above. *Egg*: Tapering but little below, the base truncate and summit rounded; vertical ribs comparatively few and distinct. *Caterpillar at birth*: Uppermost arranged appendages below the laterodorsal line, all of nearly equal length. *Mature caterpillar*: Piliferous papillae of unequal size and on abdominal segments the larger arranged only in longitudinal series. Body very slender, scarcely tapering forward, the segments divided into seven sections and the head much broader than high. *Chrysalis*: Wing cases decidedly protuberant ventrally, the tongue and antennae not nearly reaching the uncovered part of the abdomen; prominences of body rounded, the frontal projection often of excessive length with no separate curve from the head.

Tribe Pierini.

Butterfly: Club of antennae depressed, distinct, subspatulate; palpi very slender, elongate, the last joint long; third subcostal nervule of four wings forked at extreme tip; precostal nervure of hind wings bent strongly outward; middle tibiae at least as long as femora; posterior margin of eighth abdominal segment of male entire or notched above. *Egg*: Tapering but little below, base truncate; summit distinctly truncate, vertical ribs not very numerous, sharp and distinct. *Caterpillar at birth*: Uppermost ranged appendages laterodorsal, all appendages of nearly uniform length. *Mature caterpillar*: Piliferous papillae of unequal size and on abdominal segments the larger arranged only in longitudinal series. Body comparatively stout, scarcely tapering forward, the segments divided into six sections and the head scarcely or not at all broader than high. *Chrysalis*: Wing cases not ventrally protuberant, the tongue and antennae reaching the uncovered part of abdomen; carinae often raised to sharp projections.

Subfamily PAPILIONINAE.

Butterfly: Antennae more or less arcuate. Median nervure of fore wings with four branches; hind wings not enclosing the abdomen, often plaited on the inner margin. Fore tibiae with a distinct epiphysis on the inner side; each of the claws simple and long; paronychia lacking. Usually of large size. *Egg*: Spheroidal or oblate spheroidal, at most scarcely higher than broad, generally broader than high, all surface structure, when visible, reticulate. *Caterpillar at birth*: Head with no retroarcuate posterior dorsal curve, but partially covered by a fold of the segment behind. Body more or less angulated at the lateral line with ranged papillae most or all supporting several appendages. *Mature caterpillar*: Head much smaller than the succeeding segments, more or less covered posteriorly, where there is no retroarcuate dorsal curve, by a fold of the segment behind. Body frequently enlarged at the hinder end of the thoracic region, nearly naked or with longitudinally ranged fleshy filaments, or bristly mamillae, occasionally with transversely ranged piliferous papillae; generally transversely marked or saddled with sharply contrasted colors, or where longitudinally marked it is by serial spots and not by stripes; a Y-shaped osmaterium on first thoracic segment. *Chrysalis*: Anterior extremity ending in a pair of projections — the ocellar prominences — thrust some distance in front of the antennae, or with rounded front not projecting beyond the base of the antennae, occasionally (in exotic types) with a double knob of hooks. Dorsal surface of the abdomen ridged if at all on the laterodorsal line; *i. e.* double. Girt crossing the middle of the metathorax.

Tribe PARNASSINI.

Butterfly: Last joint of palpi long; wings rounded, in our species entire, the subcostal nervure of fore wings with three superior branches.* *Egg*: Very oblate spherical, deeply and profusely punctate. *Caterpillar at birth*: Bristles of body spiculiferous not apically expanded but truncate. *Mature caterpillar*: Body with ranged tubercles bearing bristly hairs or clothed with bristly hairs massed in distinct regions. *Chrysalis*: With no frontal projections, sometimes enclosed in a cocoon, or attached (in Thaïs) by the anterior extremity.

Tribe PAPILIONINI.

Butterfly: Last joint of palpi minute; wings subfalcate, the hind pair usually tailed, the subcostal nervure of fore wings with four superior branches. *Egg*: Nearly spheroidal, with scarcely

*These characters do not hold for the entire group, outside of America, where it is less developed.

perceptible reticulation. *Caterpillar at birth*: Bristles of body not spiculiferous, apically enlarged or flaring. *Mature caterpillar*: Body naked except for scanty and excessively short almost microscopic hairs, occasionally provided with fleshy filaments. *Chrysalis*: With a pair of frontal projections, hanging freely by tail and mid-girth only.

Family HESPERIDAE.

Tribe HESPERINI.

Butterfly: Tail of antennal club nearly or quite as long as club proper; abdomen generally shorter than hind wings. Males with a costal fold on fore wings concealing special scales, and with a corneous sheath protecting the extended alimentary canal. *Egg*: Subspherical, vertically ribbed and cross lined. *Caterpillar at birth*: Bristles of last segment only a little longer than the others, not recurved. *Mature caterpillar*: Body relatively stout and plump; highest points of the two sides of the head more distant from each other than the length of the base of the frontal triangle. *Chrysalis*: Tongue case not protruding beyond the tip of the wing cases.

Tribe PAMPHILINI.

Butterfly: Tail of antennal club shorter than the club proper, occasionally wanting; abdomen as long as or surpassing the hind wings. Males often with a velvety oblique streak on the disk of the fore wings, the alimentary canal not prolonged. *Egg*: Usually subhemispherical, with smooth or obscurely reticulate surface. *Caterpillar at birth*: Some of the bristles of last segment exceptionally long and recurved. *Mature caterpillar*: Body very elongate; highest points of the two sides of the head no farther apart than the length of the base of the frontal triangle. *Chrysalis*: Tongue case free at tip, protruding beyond the wings.

A SIMPLIFIED SPREADING BOARD.

Some entomological friends who have visited my laboratory recently have been unexpectedly interested in a means of setting and spreading the wings of insects that I have employed for a good while, and have asked that I should describe it. I am constrained to do so, not because the old form of grooved board with cork backing is unsatisfactory, but because my board is simpler, cheaper and can be made in a moment by any one. It is better, too, in some respects and for some kinds of insects, and I now use it almost altogether.

It consists of a thin piece of smooth board of soft wood with rows of awl holes punched through it, fastened flatwise upon another thin board of the same size. That is all there is to it. The piece with the holes in it should be of a thickness equal to one fourth the length of the pin.

To use, the pin is thrust through the insect nearly to the head, inverted, and pushed head downward to the bottom of one of the holes, and the wings are expanded and pinned down under strips of paper in the usual way, but in the inverted position.

Its advantages over the old, grooved board are: —

1. Its cheapness and compactness.
2. It can be readily made of any size or shape.
3. It will hold twice as many insects for a given area.
4. It automatically places the specimen at the proper height on the pin.
5. Less time is required to set an insect, because the body does not have to stand in a definite relation to a groove.
6. Legs, antennae, abdominal stylets, etc., tend to lie out flat on the board, and do not hang down in the way of pin labels: the legs are readily arranged with great advantage for seeing tibiai spurs, etc.

It has its limitations in the setting of insects with dorsal crests, or with dorsal tufts of hairs, which are not to be flattened out.

The simple expedient of turning the insect over for setting obviates the necessity for the groove: and after spreading on an undivided surface for a while, one comes to regard the groove a nuisance.

James G. Needham.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—XXXVIII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Paleacrita vernata Peck. This well known larva, first described by Peck in 1796 and referred to in all works on economic entomology, occurred in the Platte Canyon, Colorado, numerously on a bush of wild cherry, which was defoliated. The larvae were not seen elsewhere and were massed on one tree, not scattered as was *Alsophila pometaria*, which occurred in the same canyon.

Egg.—Elliptical, evenly rounded, one diameter considerably less but not flattened; one end slightly depressed, the other rather distinctly truncate; reticulations broad, rounded, rather ill-defined, the cell areas however forming distinct saucer shaped pits in longitudinal rows; truncate end nearly smooth; sordid yellow, subtranslucent, appearing soft-shelled, sometimes irregularly shaped, somewhat iridescent; size .8 × .6 × .5 mm. Laid in a mass probably in a crack in the bark or similar situation.

Stage I.—Head rather small, rounded, flattish before, not higher than joint 2; dull dark brown, epistoma and setae pale; width about .3 mm. Body normal, rather robust, not elongated; a broad dark brown subdorsal band and narrow dorsal line, the whitish space between irregular and cut by the annulet incisures; subventral fold broadly pale; venter shaded in brown but leaving the tubercles pale. Feet shaded in luteous brown, normal; setae short, white, rather stiff.

Stage II.—Head bilobed, erect, flat before, dull black, whitish across the clypeus, in a streak each side and on epistoma; width .4 mm. Body normal, rather short and thick, a little flattened. Black, not shining, subannulate. A geminate, white, dorsal line, slightly dotted and broken, irregular; a fine white lateral line, near to, and partly joined by obscure streaks to a broad white line on subventral fold, streaked on the annulets; spiracles in white patches; a few white dots subventrally. Feet dark, the abdominal ones white streaked outwardly, the thoracic ones pale in the joints. Joint 12 slightly angularly enlarged dorsally. Setae short, black, rather stiff.

Stage III.—Head bilobed, erect, flat before; luteous brown to black, with two transverse, dotted, white streaks, one at the apex of clypeus, the other between the eyes; epistoma pale; width .6 mm. Body moderate, normal, not elongate; black, not shining, marked in white as before, the lines all narrow, dotted, somewhat broken; joint 12 a little enlarged, the addorsal line widened on it; anal feet projecting laterally. No shields; tubercles and setae obscure, their bases a little enlarged, making the surface of the body somewhat irregular; traces of a subdorsal line; abdominal feet pale dotted outwardly.

Stage IV.— Head dull black, white dotted, the upper faces of the lobes nearly solidly black, but many dots across clypeus in two transverse bands; width 1.1 mm. Body dull black with fine, broken, addorsal and more continuous but narrow substigmatal white lines; traces of the other lines as dottings. Tubercles small, slightly elevated; setae short; black. Cervical shield, anal plate and feet slightly brownish diluted; no cornified shields. Segments wrinkly subannulate.

Stage V.— Head broad, erect, roundedly bilobed; sordid white in ground color, a black band on the vertex, one across apex of clypeus, broken, one above mouth, irregular and with dots between; width 1.5 to 1.8 mm. Body smooth, rather robust, normal, not elongate; setae and tubercles minute except tubercle ii of joint 12 which is elevated. Color variable. Dark gray, finely lined. Thoracic feet red-brown or black. Body lines addorsal, subdorsal, lateral and stigmatal, the addorsal ones enclosing black spots, or a continuous black space or broken up by red and white dots. Ground color dark purplish shaded with black laterally and subventrally and with reddish stigmatally; a dark swelling behind the spiracle; substigmatal line usually yellow, narrow, distinct; other lines more or less broken and dotted; all the surface finely dotted and mottled. Feet sometimes reddish.

The larvae entered the earth May 24th and emerged the following March. Eggs were obtained which hatched March 24th and the larvae matured again before the end of May.

Coccidae and Aleurodidae.— Two papers, embodying contributions to our knowledge of the Coccidae and Aleurodidae, have just been completed in the laboratory of entomology at Stanford University. The papers are of such size that some time must elapse before their publication, so that an immediate brief statement of their contents will probably be of interest to entomologists. "Coccidae of Coniferae" is the title of a paper by Geo. A. Coleman, based on material collected by the author in the summer of 1901, in the course of a trip on foot and horseback of a thousand miles through the great coniferous forests of Northern California. This expedition was made for the express purpose of gathering specimens and notes for a study of the conifer-infesting scale insects. Mr. Coleman collected 22 species of Coccidae from 26 species of conifers, ten of the species being described as new. Of these ten, immature stages of four are described, and the complete life history of one. The paper also includes a compiled list of the Coccidae recorded from the Coniferae of the world, and a host list with distribution. There are included also notes on the economic status of the conifer-infesting scales.

"Aleurodidae of California" is a paper by Mrs. Florence E. Dorsey which describes twenty new species of aleurodids found in California, thus increasing the number of known N. A. species in this family from 40 to 60. In the case of every one of these 20 new species the immature stages have been studied by the author and are described in detail. It is unnecessary to say that these accounts of the post-embryonic life history of so many aleurodid species constitute a really important contribution to our knowledge of a problem of much biological interest. Mrs. Dorsey summarizes her observations in a special discussion of aleurodid development. A list with references, together with an analytical table, of all the North American species of the family are given. The paper is unusually well supplied with drawings, in which work Mrs. Dorsey has been aided by Mary Wellman, scientific artist.

Vernon L. Kellogg.

THE PUPA OF MERMIRIA TEXANA BRUNER.

BY T. D. A. COECKRELL, EAST LAS VEGAS, N. MEX.

Orthopterists have not usually paid much attention to the pupae of grasshoppers; partly, no doubt, because they rarely offer any remarkable characters, and partly because they often shrivel and lose their natural colors, when pinned in the cabinet. The pupa of *Mermiria texana*, now described, is a very striking and beautiful creature when alive, and it seems well worth while to present an account of it.

♀. Length 34–36 mm., antennae 10½ mm., dorsal surface of head 5½ mm., pronotum 5½ mm., tegmina 8 mm., end of tegmina to tip of abdomen 16–18 mm., femur 16 mm., tibia 15 mm., breadth of thorax 4 mm. 21 spines on outer margin of hind tibia. Brown of various shades, with pure white longitudinal stripes; top of head with a broad median longitudinal pale sepia band, narrowly edged with darker; on each side of this a broad pale apricot or reddish-ocherous band, clouded with pale gray, and externally bordered with white, the white border running through the upper edge of the eye; next to this a broad dark sepia band, also bordered below with white; then a dilute gray band, marbled with lighter veins and at its lower part spotted with darker; this lower spotted part bordered below with white; running from below the eye, bordering on the lateral carinae of the face, is a pale reddish-ochreous band. Eye gray, its upper part spotted, its lower part striped with grayish-white. Face gray mottled with blackish, the median carinae pale. Antennae a warm brown, distinctly triquetrous towards base, not nearly so broad as the shorter diameter of the eye. The prothorax continues the longitudinal markings of the head, but the median zone, is mottled with dark gray, and its ground-color is inclined to purple, with the median carina, which is very distinct; is indicated by a pale line. The subdorsal dark band passes backwards along the thorax and abdomen, crossing the tegmina, which thus have their lower half dark and the upper a light warm reddish-ochreous. On the sides of the thorax the dark band is broadly bordered below by white; but on the abdomen it is narrow, and is bordered *above* by white.

The abdomen is strongly keeled dorsally, the region of the keel being purplish, somewhat mottled, and changing into light ochreous above the white (interrupted) subdorsal lines. Sides of abdomen mottled with purplish and dull white. Femora with an ochreous line above, and a white line at the sides marking the ridges. Tibiae pale purplish, mottled with pink at sides, with a dark gray stripe beneath. Spines rosy, tipped with black.

♀. *Green form.* Similar but apple green in place of brown, and hardly any mottling; median zone of head and prothorax a dull emerald green, not mottled. Lateral band a deep olive-green, the white edging very distinct and beautiful. Ground-color of tibiae pale bluish.

Hab. Las Vegas Hot Springs, N. M., July 11, 1899. (W. Porter and S. Mize.)

I give also a brief description of the adult from the same place:

♀. Like the pupa, but colors grayer, not so reddish; hind tibiae coral red. Tegmina blackish with a yellowish-white subcostal stripe and another stripe in the median field, beginning abruptly just below the middle of the tegmen; a longitudinal ochreous stripe along the lower margin continuous and concolorous with the subdorsal stripes of the thorax. Wings tinged with yellowish, apical third dusky. 17 spines on outer margin of hind tibia. Measurements in mm.: antenna, 16, vertex 5½, pronotum 6½, tegmina 30, end of pronotum to tip of abdomen 29½, hind femur 21½, hind tibia 19½. (Aug. 10, 1899. W. Porter). The adult was kindly determined by Mr. Scudder. Brunner found the species only among Agave; it did not occur near or upon Agave at Las Vegas Hot Springs. The tegmina in our form are appreciably shorter than in Bruner's types.

NOTES.—Carabus nemoralis Müll. is taken not uncommonly at Cambridge, Mass. Other North American records are Hudson's Bay, St. John, N. B., and Maine.

In Caterpillars and their moths (New York. The Century Company, 1902), Miss Eliot and Miss Soule record their long and varied experiences in the rearing of moths. Chapters one to six, pages 3–66, deal with appliances, structure, habits, methods of care, preservation, note-taking, etc.; and chapters seven to seventeen, pages 69–299, are devoted to more or less detailed life histories of a number of common moths, chiefly sphingine and bombycine.

The text, with the exception of the part relating to structure, is quite satisfactory so far as facts are concerned, but from a literary standpoint it lacks simplicity. The colloquialness of the style and the frequent use of "One of Us," six times on a single page, is especially displeasing.

The illustrations are from photographs by Miss Edith Eliot and show the caterpillars and spread moths of most of the species treated. Those of the caterpillars are uniformly good, while those of the moths are more uneven as properly spread specimens were not always selected for illustration. The index even as a list of names is inadequate and the rendering of some of the scientific names shows careless proof reading.

INDEX TO NAMES OF INSECTS.